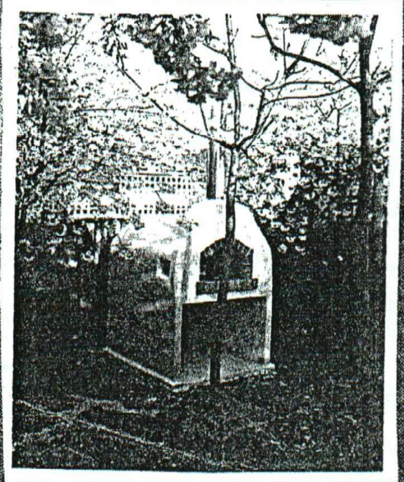

BRICK BREAD OVENS

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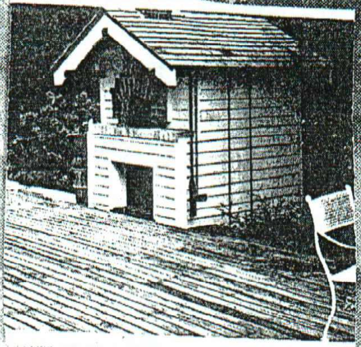

PLANS AND BUILDING INSTRUCTIONS

by Alan Scott

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BUILDING SMALL WOOD FIRED BRICK BREAD/PIZZA OVENS

Building and using a wood fired brick oven helps to bring the past and future into the present. It brings the awareness that the simplest tool fueled from a sustainable wood source can create the most nutritious possible bread right in the bosom of the family. This one act alone by a free and independent person can help change the course of a civilization presently asleep in a corporate oil dependent nightmare.

There are many ways to create an oven that will bake bread and more again to make one that bakes pizzas; the former are usually beefier to be able to store more heat but the pizza ovens can be much a lighter construction. Just because an oven has a lot of mass does not mean that it must be heated up to its capacity each time, and if there is too much mass it will absorb more heat but with little chance of returning any of it later. However it is nice to have the capacity to build the heat it up to its most efficient maximum so as to hold an even, steady heat for multiple batches of bread baking and other uses like roasting, followed by days of other baking. They also can be heated minimally for one particular function like a pizza party or a single batch of bread.

The simplest of these ovens is the so-called "black" ovens, where the bake chamber doubles as the furnace where the fire is also burnt to heat it. Not all shapes that are good as bake chambers fit well with their function as a furnace. Longer vaulted chambers work better than a simple round domed oven for both purposes; they are the most efficient shape for holding many loaves of bread and the best shape to draw their intake air and exhaust the fumes well as the furnace. Their footprint on the ground is 15% more economical of space than a round shape.

In these oven designs the oven chamber itself is of bricks but due to their shape they need a concrete covering to hold them from collapsing especially in transportation. For the concrete to do its work as a structural element a certain thickness is a must, but the bricks can be placed either the "thick" way or the "thin" way to vary the total thickness depending on your choice of primary use. The thickness of the concrete surrounding these ovens can also be varied but within the parameters as explained above.

It is the comprehensive insulation concept of these particular ovens that has lifted them out of the traditional past into a new era of efficient fuel use, workability and portability. This is partly accomplished by the unique placement of the reinforcing bar in the oven concrete to isolate the heat sink mass of the oven chamber from its surroundings, and complemented with its massive and total insulation.

These ovens are designed by an amateur for other do-it-yourselfers who may or may not have any particular construction skills or masonry experience. They are designed to make use of what are common materials already locally available nearly everywhere.

ALAN SCOTT Alan Scott

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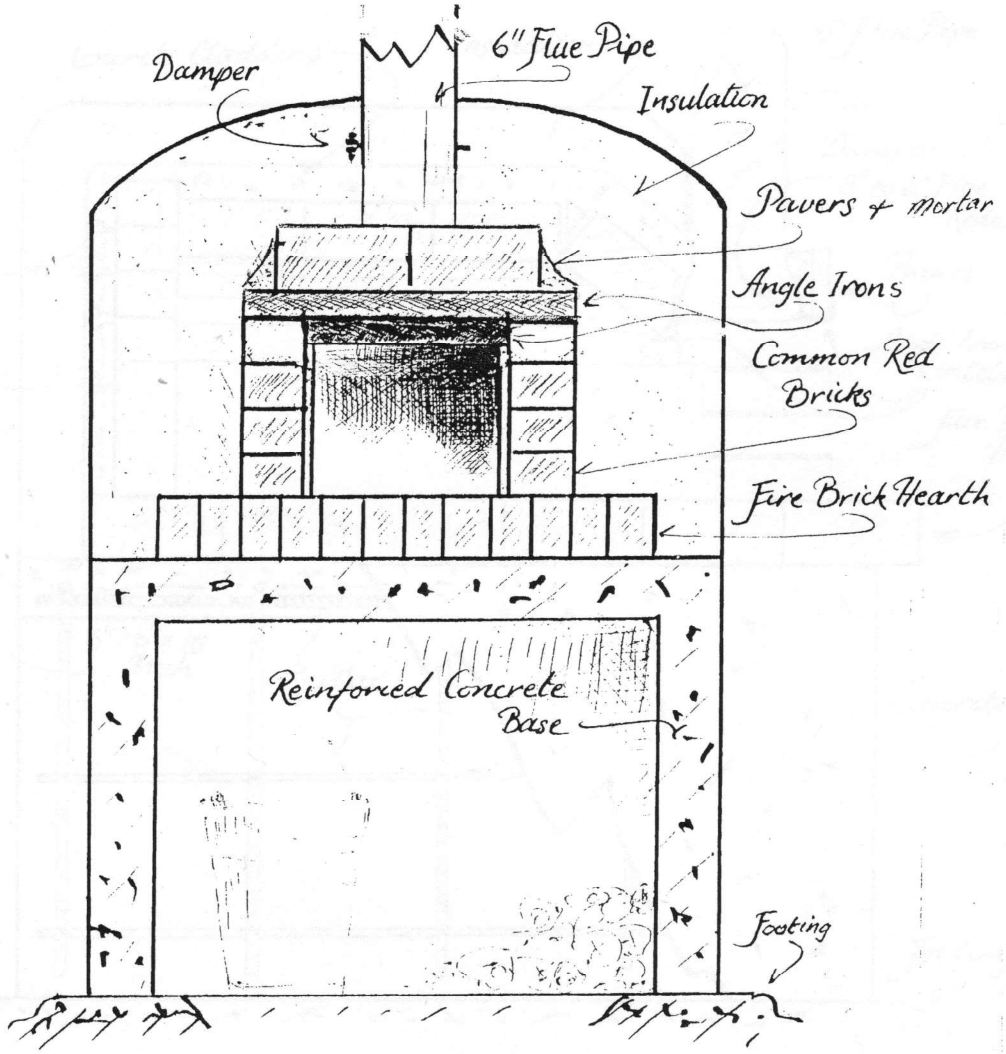
20" x 30" BEGINNERS BREAD OVEN



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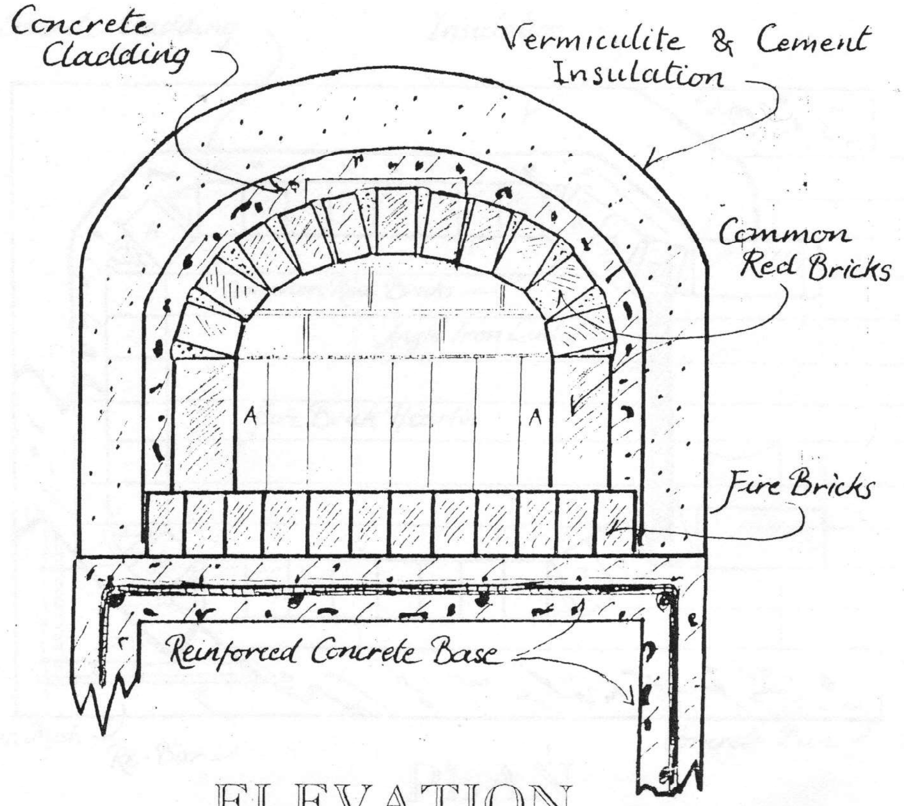

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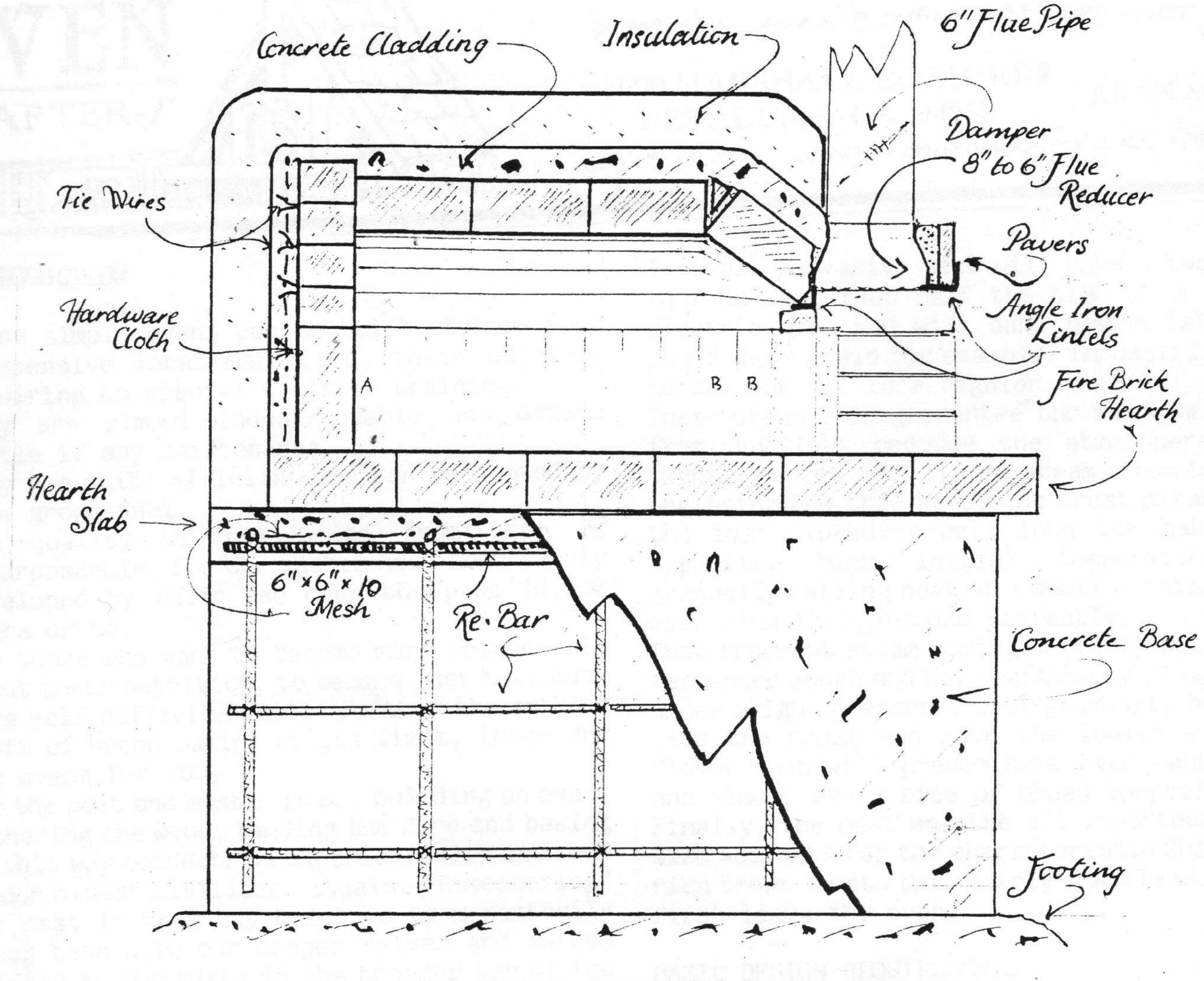
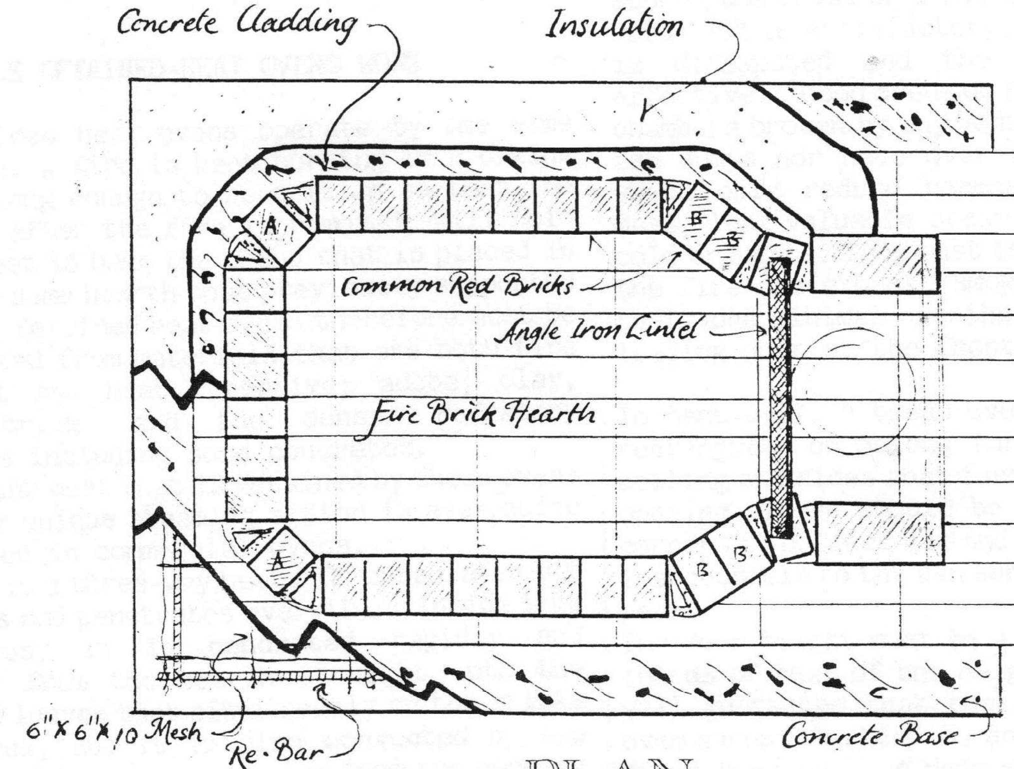


SECTION

SCALE 1"=1'



PLAN

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INTRODUCTION

These simple ovens can be built at home from inexpensive local materials, their assembly requiring no special tools or training.

They are almost indestructable and demand little if any maintenance.

They are quite efficient and can be heated by home grown fuel.

The quality of the bread from them is unsurpassable, for our tastes have been surely developed by their use over the past 10,000 years or so.

For those who want to become more responsible about their nutrition, to become just that much more self sufficient or to furthur the art and craft of bread baking to its limit, these are the ovens for you.

For the poet and mystic in us, building an oven, gathering the wood, tending the fire and baking in this way connects us experientially with one of our oldest civilized rituals. "Remembering" our past in this way helps us to momentarily touch base with our deeper selves and awaken briefly to our place in the broader web of the biosphere that supports and sustains all life.

For everybody, just one bite into a crusty slice of fresh baked bread speaks eloquently for itself.

HOW SIMPLE RETAINED-HEAT OVENS WORK

All retained heat ovens operate by the same principle. A fire is kept burning in a baking chamber long enough to heat it up so that the chamber, after the fire is removed, will hold enough heat to bake the bread that is placed in it on the same hearth that previously supported the fire. Retained heat ovens therefore must be constructed from materials that are both fire resistant and heat retentive; adobe, clay, stone, brick, and the denser refratory materials including some concretes.

Neither the heat that is retained by these ovens nor their unique steaming action is ever quite duplicated in commercial ovens.

The heat is a three-way heat. It is **radiated** off the walls and penetrates everything inside like microwaves, it is **conducted** rapidly and directly from the hearth straight into the unpanned loaves that sit directly on the bricks themselves, and it is also **convected** by the movement of the steam escaping from the cooking bread dough.

This all pervasive heat will bake a two pound loaf in less than half the time of a gas or electric oven and will bake loaves (six plus pound whole grain for example) impossibly large to bake at all in a regular oven.

These ovens also guarantee the maximum spring from any loaf because the atmosphere in a tightly sealed oven is kept steamy from the very beginning and this keeps the crust pliable and the loaf expanding well into the bake. The typically high initial temperature and gradually falling heat of a small retained heat oven aids this process perfectly.

That fragrant steam coming directly out of the fermented dough and held captive by a tight oven under slight pressure, will gradually be baked onto the crust and give the loaves a unique flavor that will predominate over each slice and almost every bite of bread thereafter.

Finally, the heat and the all important steam also accounts for the characteristic shiny deep rich brown crusts that fairly crackle when they first leave the oven.

BASIC DESIGN REQUIREMENTS

A bread oven should have a low ceiling to concentrate the steam but not so low as to scorch the crust or leave no room for the firewood; 15" is satisfactory. Above 18" the steam is dissapated and the heat becomes less effective. Good ovens do not have their baking chambers broken by any vents, flues, dampers or ash dumps nor have over large doors, all of which only reduce necessary heat retaining mass, leak valuable steam and let in unwanted cold draughts. They must therefore draw air for the fire and exhaust smoke and fumes through their one minimal opening, the bread and wood loading door at the front.

To heat well, a bread oven must be a long low rectangular or oblong furnace with a rounded ceiling and sides that funnel gently to the door opening. There should be no nooks, ledges or corners to collect ash and charcoal and no areas inaccessible to the ash scraper, wet mop or oven peel.

The door height must be a little less than two thirds of that of the height of the dome. This will guarantee that the flow of air into the oven across the hearth, and the fumes and smoke drawn back out the door and up the flue, will move at an optimum pace. A higher door will kee

a fire burning so well that all the heat goes out with the smoke, and too low a door will choke the fire altogether.
A retained heat oven must have just enough mass in its hearth, wall and dome material to store the heat necessary for baking, and the denser this material is the better, with the hearth more massive than the rest by about 10%. With modern materials oven design can be refined to suit a particular need. Comprensive insulation can further this process and impressively up past efficiecies.

BUILDING AN OVEN TODAY

To build a retained heat oven today one has the advantage of a wide range of suitable materials and techniques and can draw upon a vast reservoir of knowledge never available before. All together this promises some exciting new and improved oven designs, with increased performances and fuel efficiencies, constructed in a simpler way and even with some whole new virtues like portability.

These particular oven plans, the building techniques, the local materials, and the way to use the ovens are presented here in such a way that preserves a direct link with traditional handicrafts and our culinary roots and processes; but it is only one approach. The principals have been briefly explained so that greater understanding may lead to more creative adventure in oven design and construction in the future for anyone who wants to try their hand at building one differently.

THESE NEW ENGLAND DESIGNS

The uniqueness of the ovens as developed here in these plans is in the location of the flue close to the oven doorway. Besides it being a compact and tidy way to draw off fumes allowing the oven to be built and used indoors, a forced draught can be developed simply with the use of a deflecting plate (see fig.1) to stimulate the fire when it is first lit or any time it may need a boost, and a damper can be installed in the flue to further control the rate of burn.
Other improvements incorporated into these ovens are; placing an ash dump immediately in front of the oven door; the balanced proportions of hearth mass to wall and ceiling mass, more usefull rising heat being stored low in the structure, but not too much; ovens whose total mass is tailored to the needs of non-continuous baking balacing quickest fire-up with longest baking time; insulation for optimum efficiency to the extent of suspendi the whole hearth and all in the larger oven t give it a distinct thermal break from its base; and in using reinforced concrete bases and hearths that can with foresight, make these ovens portable given suitable fork lift equipment.

SIZE CONSIDERATIONS

These ovens need to be fully loaded to create lots of steam and so bake the best bread, therefore check the oven size that it will bake your bread needs in full oven batchs. This is the main size consideration for the bread enthuiast. Since these ovens retain their heat for days, the temperature gradually dropping all the while, they can continue to bake more bread in the beginning and then a series of foods following in order; pies, cakes and cookies, cassaroles, sprouted wheat and fermented rye breads, puddings, fruits and whole vegetables, crackers, jams and custards, drying fruits, herbs and nuts, yogurt, etc.,and drying the kindling and wood for the next firing. If any of these items are particularly important the oven should be large enough to accomodate your production needs.
Check your baking pans, particularly the sheet pans that they fit the door and have room enough inside.

USE CONSIDERATIONS

Another excellent use for these ovens is for baking pizza, or pita breads or matzoh crackers. These and similar breads require that a fire remains burning in the oven while they are baking. A wider hearth to accomodate the fire gives more space for the baking, and a wider, higher door facilitates the loading and turning of the breads during the baking.
These modifications will compromise the regular bread baking virtues of the oven, so the final design will be determined by your baking priorities.

STYLE

There will need to be decisions on the materials to be used for the base, case and roof, and as to what else the structure must accomplish besides the baking like wood storage, protection for the baker, built-in benches and proof area asethetics, etc.

SITE

Choosing a site is an important consideration. The whole structure requires a considerable area to stand on plus room for a solid footing. These ovens rise to a height of five feet not counting the flue which needs at least two or three more feet but can extend to almost any height if necessary. There will be some smoke at the beginning of a firing exiting from the flue so prevailing winds or draughts may determine the location of your oven.

The oven should be placed within practical range of the kitchen, the kneading, shaping, and proofing area, particularly the latter. If you are considering an indoor location, be prepared for a major remodelling, a lengthy planning and permit process, and escalating expenses for foundation, flue, ash disposal and cleanout, detailing, finish work, and so on.

Protecting the oven opening from wind is important to the draught and heating performance. For year round use, at least a roof over the baker and the bread dough poised at the top of its proof as it is loaded is also required. There must be plenty of elbow room to set, stir, rake out and mop the oven, also for handling proofed loaves and peeling them into and out of the oven onto cooling racks. Also a dry storage for wood if the space underneath is reserved for other uses, with perhaps room to expand the baking operation later to include room for milling, a grainery, proof cabinet, cooling racks, and so on.

PERMITS

For private use outdoors a small bread oven will pass as a barbeque. Indoors it must be treated as a fireplace at least.

BRICKS

Choose bricks for their density. A good dense brick is usually heavy and hard and a little more costly. Do **not** use lightweight fire bricks.

Of the two nationally available common red bricks these oven plans are drawn using the larger "standard" brick that in this area measures exactly 3 7/8" thick, 2 1/2" high and 8 1/4" long. If you use the popular "modular" bricks, your oven will turn out 10% smaller. The hearth bricks as drawn are of "fire" bricks that are universally 4 1/2" thick, 2¼"-2½" high and 9" long.

When faced with having to use the smaller "modular" bricks one must choose between having to either decrease the size of the hearth and base to accomodate the smaller oven, or to add more bricks to the oven design to increase its size to fit the hearth. Similarly if it is decided to use the larger fire bricks throughout the oven, then either the hearth and base must be increased by about 10% to accomodate the larger oven, or some bricks subtracted from the oven design to decrease its size to fit the hearth and base as shown.

DESIGNING YOUR PARTICULAR OVEN

Although the plans are drawn in detail, it is most likely that given your local bricks and personal requirements, it will be best to re-design your oven from the start. This begins with the bake chamber and what you are going to be baking in it.

1. OVEN. Lay out according to the plans the first upright course of the oven with the particular bricks that you have acquired on a convienent surface allowing 1/4" for mortar between them. Does the resulting oven hearth meet your baking needs? Does the door opening accomodate your favorite bake pans or have a little extra width for pizzas if they are to be important? You may want to widen the chamber too in this case. If the site has restrictions this is the time to make changes. But be aware that any modification for baking must preserve the oven as a fire chamber that draws well, narrowing towards the door and being slightly longer than wide altogether, and with rounded rear corners to facilitate ash removal and mopping.

This mock-up will give the exact oven dimensions and dictate the size of the hearth that it must sit on.

2. HEARTH. Now lay out one row of the hearth bricks on edge, end for end, along side the length of the oven mock-up, and another row, also on edge, side by side across it. Place the bricks of both rows tight up against each other for there is no mortar used in laying the hearth. This will determine the exact dimensions of the brick hearth that will underlay the entire oven and the number of fire bricks that you will need.

3. SLAB. The slab must allow at least 2" of room out from the sides and rear of the oven bricks (not the hearth bricks) to accomodate

the 2"-3" of concrete cladding that will be added later to beef up the mass of the oven walls. The hearth bricks may or may not end up covering this slab to its very edge, but they should at least underlay and support the walls.

3 BASE. Next, the concrete slab that carries the hearth bricks and the oven itself (unless you are building the all concrete base), must "float" clear of the base walls by 1" or the width of the 1"X4" to be used in the form work, and so as you have the slab dimentions you can now arrive at the INSIDE dimensions required of the base walls. If cinder or concrete blocks are to be used here, then the base OUTSIDE dimension will be greater by their width of 8" twice, or 16".

At this point it may be discovered that the base dimensions do not fit well with the modular of the blocks so some juggling of the slab or air space size could be in order to make it fit comfortably and save the job of cutting base blocks to fit.

If you are building the all concrete base that does not "float" the oven, allow 6" to 8" out from the oven bricks side and rear for insulation and a further 4" if a brick oven casing is desired.

4. FOUNDATION. The size and dimensions of the trench or slab for the foundation of the base walls can now be calculated by adding a further 2" to 4" each side to the base and wall widths. This trench can now be marked out ready to be dug down to a firm sub-soil stratum below the frost line, or the trench filled with coarse gravel to provide a footing for the foundation concrete. The foundation can be strengthened with reinforcing bar if necessary.

5. HEIGHT. The most comfortable working height of the oven hearth should now be considered to determine at this stage the level of the foundation and the number of courses of block in the base. Beginning at ground level, three courses of blocks of 8" plus 2" more for that portion of the hearth slab that protrudes above the top course of bricks, and an additional 4" of hearth brick and mortar will result in a convienent hearth height of 30". This can be easily altered by increasing or decreasing the height of the concrete wall foundation building it up with formwork or digging it lower down into the ground, or adding additional courses of full, half or capping blocks.

BEGINNING TO BUILD

Satisfied with your design, with the materials and tools collected and friends and neighdors invited to a good old fashioned "oven raising", this is it!

1. Mark out the trench and dig it to the necessary depth.

2. Using the trench as a form or constructing one from wood, pour the foundation and trowel it smooth and level.

3. Lay the first course of blocks onto the foundation with mortar, and leave space for the gap front, rear or side that gives access to the underneath of the oven. Usually this space is reserved for ash collection and wood storage.

4. The top course of block will need to be strengthened to bear the weight of the re-bar ends protruding from the hearth slab and to prepare its top surface for the first courses of the oven housing of regular brick or 2"X4" wood framing or whatever, and this is done by filling the cavities in them with concrete, but first a layer of 6" metal lath must be laid on the top of the **next to top** course of block so that only the top course cavities need be filled. Tightly crumpled paper can be used likewise to support the concrete fill, a method that can be used after the last course is laid. For an extra sturdy base the re-bars in the hearth slab can be run down inside the blocks and the cavities filled completely with concrete. Likewise an oven raised off a reinforced foundation can have the re-bar extend up inside the block walls as well.

If 2"X4" framing is to be used later for the oven housing it can at this time be anchored on top of the block walls into the fresh concrete fill with long nails.

HEARTH SLAB

Ovens of old had a varying amount of mass in their hearths being laid over fill or at best over a thick suspended stone. Today we can use reinforced concrete to cast a slab that will both support the hearth bricks and beef them up into a sufficient mass to keep the oven hot for a long time. Heat stored in the hearth and its supporting slab is the most useful heat as it alone comes into direct contact with the foods and oven ware that rapidly absorb it by conduction.

Thanks to the strength of reinforced concrete these ovens call for a slab that with the bricks is only 10% more massive than the oven walls and ceiling. This amount of mass heats up fast and economically, yet gives back even heat over a long time.

Form-work allows this slab to be poured in place complete with a layer of insulating material beneath it. (Vermiculite : Cement 6:1 about 3" thick) (Not shown on plans)

1. Cut a sheet of ply to fit the cavity between the walls and brace it underneath with 2"X4"s so that it will hold the weight of the concrete without distorting and shore it up from the ground into position as determined next in 2.

2. To arrive at this position start with the position of the re-bars. The re-bars running **across** the slab will sit flush on top of the base blocks, and the ones running **lengthways** will be beneath them notched into the base blocks. This means that the top of the top base block then is level with the CENTER of the slab and as the slab will be as thick as a 2"X4" then the bottom of the slab will be a tad more than 1 3/4" below: Measure and mark this as a line drawn in crayon along a straight-edge around the inside of the base. Now make a second mark 2" below this to allow for the layer of Vermiculite/cement insulation underneath the oven and shore the ply up to this mark.

2. When the ply is in place mix and pour the Vermiculite/cement insulation mix. Stud it with a few 4" flat-head nails placed points up so that it is well anchored to the concrete to follow above.

3. Determine the re-bars required by the rule of "not further apart than 12" and not closer than 3" to the edge of the slab", as the plans show, and cut them to extend 3" onto the wall. Lay them in position and set the row that lays along the oven down into the wall 5/8" by chipping or cutting the block away. Tie them together in place.

Although it is advisable to keep the reinforcing to a minimum reducing the chances of the concrete cracking from the expansion and contraction during a firing, a layer of 6"X6"X10 reinforcing mesh can be placed on the re-bars now for extra strength if the oven is to be moved about at all in the future. This suspended slab design besides creating an efficient thermal gap between the hot oven and the cold base, also allows the oven to be lifted free and moved without damage.

4. To make the form-work for the slab itself and the air space between the slab and the base walls, set 1"X 4"'s on edge framing the space on all sides cutting slots in them everywhere there is a reinforcing bar so that they seat down into place. It helps to space this frame out 1/4" from the walls so that it can be removed easily later. To cut the slots you can drill a 5/8" hole through the 1"X4" then cut to it with a saw; the off-cut pieces can be replaced for a tidy job. Set this frame in place after the insulation is poured and set some and true it accurately with a level. Its top edge will be used to strike off, or screed, the concrete slab with a see-saw board when it is poured.

5. Wet down the form, mix up a 3:2:1 or readymix concrete, pour and strike off leaving the slab level but not necessarily smooth.

THE HEARTH

As soon as the concrete of the slab is set, even before the formwork is removed, the hearth bricks can be laid.

1. From your bricks choose those with the best unblemished edges for the center of the hearth and any others for the back row or the two rows on each side that will end up covered by the oven walls.

2. To set the bricks true measure the center line of the slab and mark it at each end where it can be seen on the base blocks.

3 OMIT

4. It was common for commercial oven hearths to be laid on a bed of sand so that they would seat well onto the base and that they could be easily removed and replaced when worn. The same is achieved here using a mortar of 1 part sand to 1 part fire clay spread very thin like tile adhesive onto the slab

5. Each row of bricks can now be positioned and gently tapped with a soft mallet into place and levelled off with its neighbors. No mortar is used **between** the hearth bricks. Start with the bricks that form the ash dump an run them all the way to the rear, then fill ou the sides. During this process a thermocoupl wire can be positioned to run along the sla

terminating with its probe **drilled into the** brick in the center of the hearth and just 1" below the hearth surface.

6. The very front row of bricks are laid separately using regular cement mortar both underneath **and** between.

7. Wait a little time for the mortar to firm up under the hearth bricks before proceeding with the oven brickwork.

OVEN BRICKWORK

Unlike regular brickwork, the bricks of this oven are held together with less mortar, about 1/4". The mortar mix is modified by adding fire clay to give it a similar expansion rate to that of the bricks and making for a mortar that will rather harden with heat than soften, as is the case with simple cement/sand mortars. The fire clay also adds a sticky quality to the mortar which helps to build this novel oven shape.
Bricks should be briefly dunked in water before "buttering' and laying them or the relatively thin amount of mortar will quickly loose its moisture to the dry brick and become unworkable.
The mortar mix is 10 parts MORTAR SAND, 3 parts PORTLAND CEMENT and 1 1/2 parts FIRE CLAY.

SIDE WALLS

1. Without mortar, stand up all the bricks of the first course of the oven judging the 1/4" space between for mortar and making certain all is in place as planned, particularly the two door jamb bricks.

2. Mark their outline with a thick carpenters crayon on the hearth bricks. Remove the bricks and begin mortaring them in place starting with the door jamb bricks and be particularly careful that they end up exactly opposite each other. Mortar all wall bricks in place finishing up with the bricks in the middle of the back of the oven.

3. Next mortar in place the bricks that make up the entrance up to the height of the upright bricks, being sure that they are positioned 1½"-2" wider each side than the upright jamb bricks.

As the work progresses keep sponging off the excess mortar and keep the bricks clean on the inside faces; a drop cloth over the hearth helps too.

ROOF

Next comes the exciting part of laying the vaulted arches of the roof, but first there is some preparation.

1. Mortar in place the bricks of the rear wall on top of the rear row of upright bricks. The first arch will be mortared to it.

2. Place the angle iron on top of 1" thick slices of brick mortared to the tops of the upright door jamb bricks to give the oven opening the exact height of 10" and see that the jambs and angle iron lintel end up on the same plane so that the door will seat well.

3. Next mortar in place the outer entrance way bricks up a full four courses so that the angle iron lintel will be well braced when the final roof course is laid up to it.

4. Two templates for laying the arch must be made. Along the bottom straight edge of a sheet of 1/2" ply mark off the inside width of the oven wall. Then from the mid point of this line mark a point 7" above corresponding to the height above the top of the walls of the oven to the height of the dome, a total of 15" minimum. Now lightly sketch in a long low arch that connects these three points. Then stand up on end the necessary number of bricks that will form this span along this rough line, with each brick touching its neighbor on the inside of the arch, and tilted to be evenly spaced on the outside. Flatten out the arch as much as you dare in the center, and bring it down as abruptly as possible at the ends where the arch will meet the walls. Now with a marker trace the line of the bricks following faithfully their every facet, and cut out two of these templates with a saber saw.
Nail them to the opposite sides of a short length of 2"X4" and the form is ready to place in position spanning the oven walls. Position it on two upright bricks at the rear of the oven on a 1/4" spacer of cardboard.

5. As there is some outward thrust exerted by the arch during construction particularly, brace the walls off the base to hold them from any movement when laying the archs.

6. Now lay the the first arch. Start by laying both end bricks that rise off the walls. The mortar required is so thick on both these bricks that chips of brick should be wedged into the joint to help it stay in place. Once both of these bricks are in place the form

will not shift. Continue to lay the remaining bricks working towards the top being sure that each brick sits accurately on its facet on the form; that each brick touches its neighbor at the bottom; and that they are evenly tilted. The last brick will fit just right with a little tapping into place with a wooden mallet if all goes well.

7. The arch form can now be carefully removed and moved forward ready to support the next arch course.

8. At half wav lav a temperature probe **exactly one inch deep drilled into the middle of the first brick of the arch.**

9. In the larger oven leave the form in place under the third course, and in the largest oven under the forth, and set up two 2"X4"'s or a single 2"X6" across the wall bricks as they funnel in on both sides to support a row of bricks that will now come directly off the angle iron of the door, in a straight line with no attempt at arching it. The angle of this row is critical and must allow for the final row of shaped bricks to mesh with the still supported regular arch course in a continuing curvature. See photos and drawing p3 and 4 of the 36 loaf oven sheet.

10. The final roof course of all the ovens bridges the remaining gap without a form laid brick by brick custom cut to best fit the resultant shape of the cavity wherin a curved course must mesh with a straight one. When all possible gaps are filled the forms are removed to allow the final holes to be bricked in and cleaned up inside. Any ledges on the inside must be mortared up.

Keep a drop cloth on the hearth, and keep sponging the excess mortar off.

CONCRETE CLADDING

An oven built of a single thickness of brick will not retain much heat beyond a single batch of bread so more mass is desirable. Traditionally oven walls were built two bricks thick and the vault or dome of bricks set end on giving a thickness of about 9". Often sand was banked around the oven too. Equivalent mass and considerable added strenght is gained in these designs by a carefully applied 3½" layer of reinforced concrete over a single layer of brickwork. This departure from tradition would make most masons apprehensive of cracking, however the use of household aluminum foil between the bricks and the concrete layer allows the bricks just enough room to "slip" when they heat and expand rather than force the concrete to fracture.. The use of foil adds two important virtues as well; one is it increases the thermal efficiency of the ovens, and the other is the way that it conducts the heat of the fire quickly and evenly throughout the entire oven considerably reducing the old problem of hot spots.

Besides its function as a heat sink, the concrete layer if reinforced with mesh will stabilise the brick arches and relieves them of the necessity to exert outward thrust onto the oven walls risking a collapse. This unusual ploy eliminates the need for tie rods or other forms of bracing of the oven vault.

Be in no hurry to cover "green" brickwork with the concrete, for drying at this stage goes fastest. In fact pouring the concrete over dry warm bricks may result in "building in" valuable stress relief since the bricks will be in their expanded mode while the concrete sets.

1. Place ply formwork 2" out from the oven by simply wedging it against the concrete hearth or otherwise boxing in the oven following its shape until the form meets the bricks that make up the doorway. This formwork need only extend up to the top of the walls for the roof can be simply trowelled into place, to a maximum of 3½" thickness on top.

2. Lay only [illegible] one layer of heavy gauge annealed household cooking foil over the brick arches. Rear wall of the oven need not be so covered.

3. Cut the mesh to length and form it to fit over the wrapped brick vault, (it is not necessary across the back). Use one layer for the smallest oven but two for any larger. Position it very carefully using brick chips so that it will end up just 1½" off the bricks when the concrete is in place. This will give the concrete the maximum strength against outward thrust from the bricks.

4. Tie a piece of 1" chicken wire across the rear of the oven to stop the cladding ever separating from the bricks and to help hold the larger mesh in place.

5. When pouring the concrete tamp it well down into the narrow form with a length of re-bar and strike the outside of the form with a hammer to get it to settle. Try not to tear the foil.

6. Don't try and tie this concrete layer into the previously cast slab with reinforcing bar or mesh; it is better if it sits free on the oven much like a lid on a pot. Dangerous stresses will not therefore build up.

7. It helps to have the first courses of the brick flue laid before the concrete is poured. The 3" depth can be marked on them with a crayon and the concrete trowelled right up to them tidily. Gauge the depth of the layer on the top of the oven with a flat head nail protruding 3" from a small piece of wood.

CURING AND DRYING THE OVEN

Before proceeding furthur the oven should be left to **cure** for at least one week, or two if time and patience allows.

Before adding the insulation and boxing in the oven now is the best time to **dry** it out thoroughly by a series of small fires burnt in the oven chamber. Begin with very small fires of kindling, three a day for the first three days, then increase the length of these fires by adding wood to them for the rest of a week. A simpler way is to set a small electric space heater, the type with a fan, in the oven on low for a week.

OVEN HOUSING AND INSULATION

Ovens traditionally have been protected from the elements by housing them in some manner. This helps a great deal with efficiency, but also needs to protect them, and the baker too, from the winds that can so upset the air draught and heating performance. This latter is simply done by having their shelters protruding forward. In some rare cases ovens were insulated with a layer of ashes, and many were covered with sand which served both as a heat sink and insulation too after a fashion. In hot climates they seem to be purposely unhoused but placed in the sun for solar assistance.

Today it is a simple matter to box in the entire oven and thoroughly insulate it with a variety of materials yielding previously unattainable efficiencies.

Masonary, wood or a combination are the main choices and the plans show some proven possibilities. The oven requirements are for a good 6" of insulation all over, and protection from water, and so long as these are met the style has great flexability. The simplest of all is shown on the small oven that is coated, with the use of forms of ply or waxed cardboard, with a thick layer of a mix of fine VERMICULITE or POOL BASE and cement 6:1, For a waterproof skin this layer can be rendered with a cement sand stucco of 1:1. with an added waterproofing agent.

Temperatures on the outside of the oven may reach 500 Deg.F and cracks could develop and allow the passage of fire through the walls so insulating materials must be fire proof to this extent. Silica blankets and vermiculites both are suitable, but if the latter are used in granular form, the thermal gap around the hearth should be filled with the 4:1 Vermiculite cement mix to stop it leaking out.

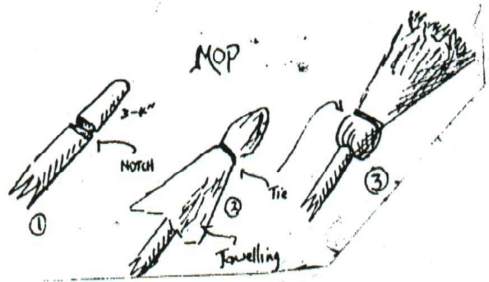
TEMPERATURE MEASUREMENT

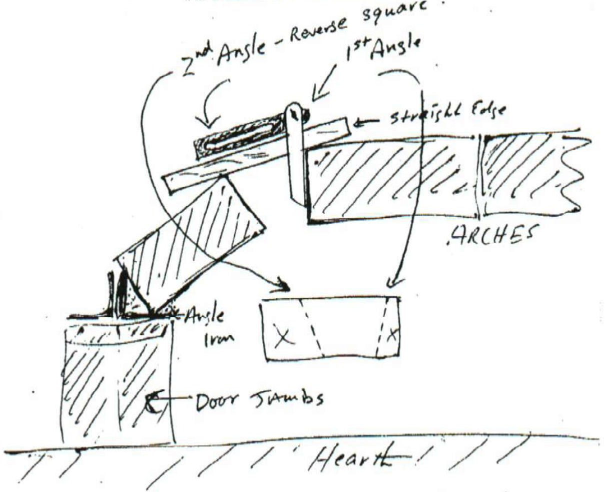
Unlike most ovens the temperatures during fire up reach over 1000 Deg. F. in the bake chamber. Temperature readout meters and thermocouples are generally available from ceramic supply houses, and other sources, meeting this range made up ready to install. Ideal for these ovens is glass insulated AWG #20 gauge ANSI type "K" thermocouple wire and a 1000 deg. F "K" type pyrometer readout meter. The wire is easily cut to length and the ends sweated together with a hot flame to form the thermocouple. Plugs fitted to them allow them to be connected to a single meter in turn for accurate and comprehensive temperature monitoring. Two positions in the oven have become standard and the baking chart that accompanies these plans refers to these alone. One is placed 1 inch down from the surface of the hearth bricks in the center of the oven, and the other is placed 1 inch in from the brick surface half way into the oven and half way up the side wall, which is just on top of the upright wall bricks.

ACCESSORIES

The oven DOOR should be made of thick softwood acting as an insulated stopper, or can be made from ply with an air space and several layers of aluminum foil in the sandwich. The inner face should have thin sheet metal tacked to it, and a convienent handle is had from masons suppliers sold as replacement handles for concrete finishing floats.

To bake pizzas and the like leave a fire of large diameter wood burning in the oven and rake it to one side or the other or both, or to the rear, and rake it back again occasionally to re-heat the exposed hearth that is used to bake on. The constant fire and coals are required for many similar breads to keep the oven air temperature very high, about 700 deg. for rapid and efficient baking, and to provide light to see.



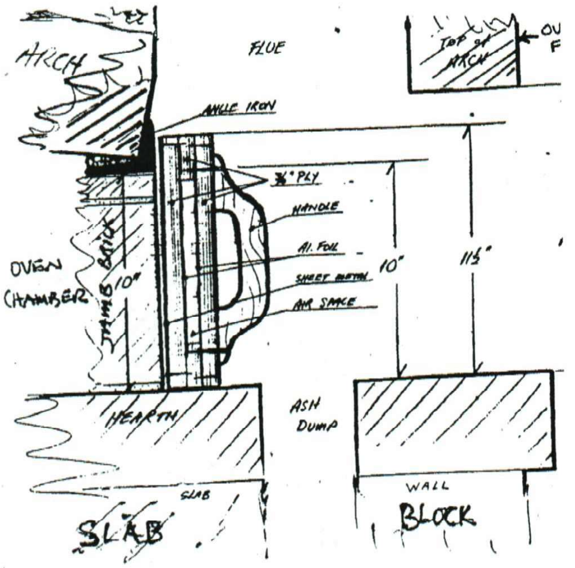


How to mark last dome bricks

FIRE UP

Ovens need dry wood split to 2" in diameter no longer than the oven. Hardwoods are good taking longer to catch and burn than softwoods, which are best as kindling. Softwoods can be burnt up to 3" or more in diameter.

First set a kindling fire just inside the oven and gently push it to the rear when it catches. Add some wood and set the DRAUGHT DOOR in place fully extended. When this fire has caught and begun to heat the oven, pile on the rest of the wood loosly and replace the draught door if necessary. At least check the fire an hour later and stir the coals thoroughly spreading them evenly over the oven floor, except perhaps in the middle that is the hottest spot by now.



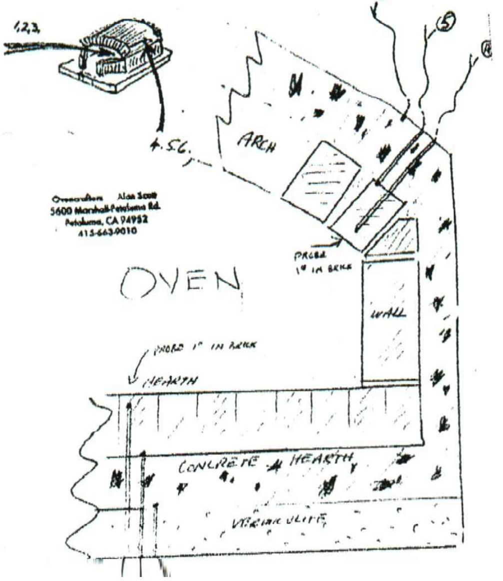
DOOR + DOORWAY DETAIL

The paddle of the PEEL is sawn or planed frc hardwood, and the handle of a lighter woc finished to an octogon in section for a fir grip. The paddle is fastened to the handle t two wire pins.

A MOP can be custom made to the oven by notchir a suitable handle to a 1/4" depth 4" back frc the business end and placing an 18" square c two of towelling squarely over it and wireing tightly into the notch. Fold the towell forwar and tie it again 2" back from the end and tr the cloth off straight.

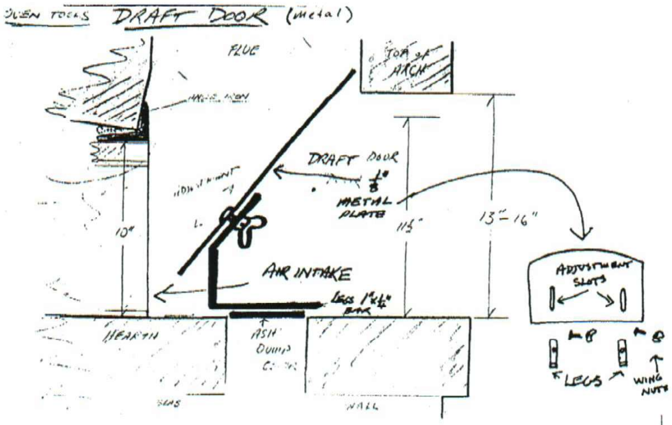
A long POKER is needed to stir the fire, and broad hoe like SCRAPER to remove coals a ashes, also a PAN HOOK is useful, and a met BUCKET to receive the hot coals and ash and small WATER CONTAINER to dip the mop into.

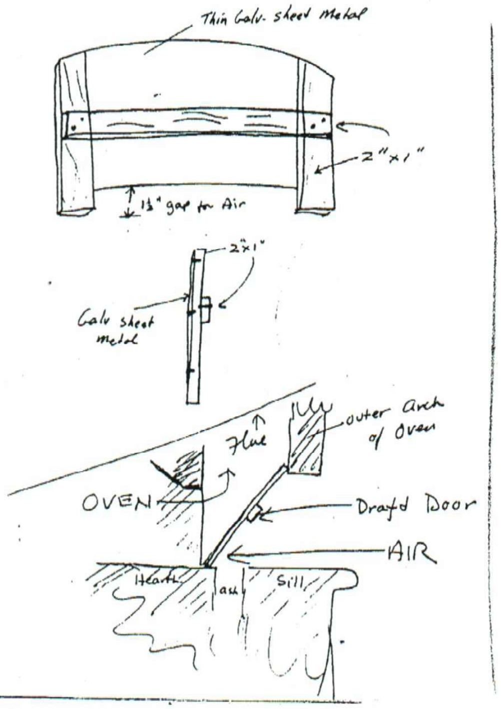
- PROBE LOCATIONS -



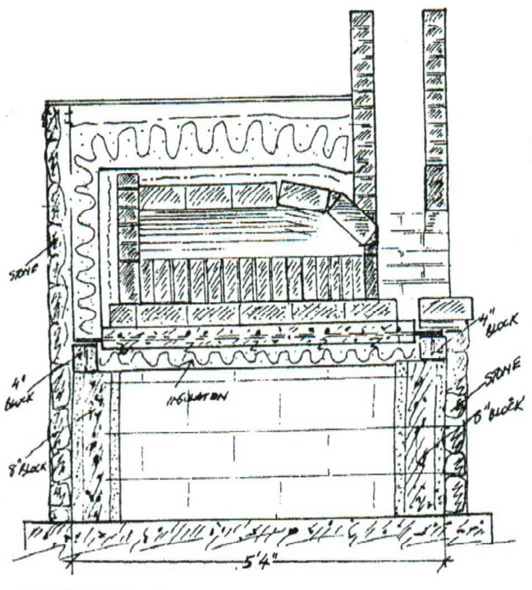
Another 30 minutes and there should remain only ashes and an odd unburnt ember. Rake the oven and wet mop it and it is ready for loading.

The oven temperature can be judged in many ways. Normal baking temperatures are too high for to soot remain unburnt inside an oven, so one sign is to see no soot remaining on the bricks, or the oven "white hot" as it was sometimes called. The sparkle of charcoal dust on the hearth during rake out is another sign of a hot oven, so too the degree of sizzle of the mop as it seems to dance effortlessly across the heated bricks. Other time honored ways to gauge' the temperature include reaching into the oven and counting the time before it becomes too hot to bear or tossing some flour onto the hearth and watching how fast it browns.

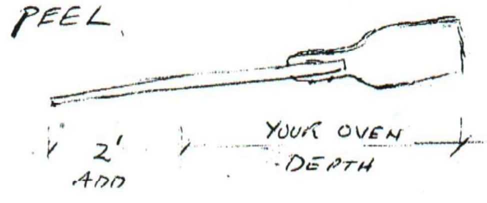


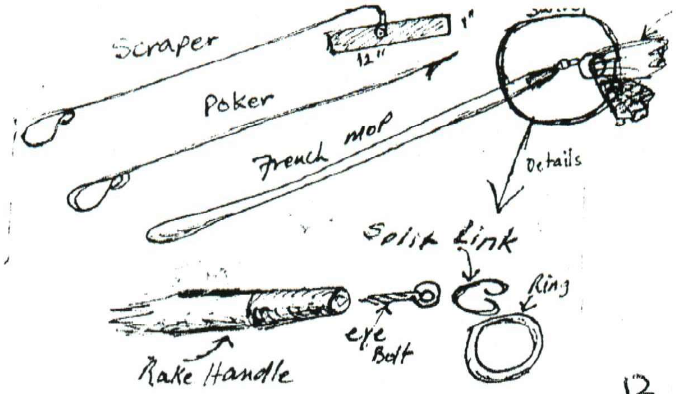


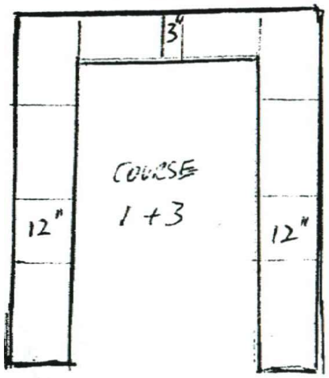
Bread baking range is 500 to 700 deg. F , brick temperature that is, at rake out. Air temperature is approximately 100 below this and is the temperature given in all recipes today. When an oven is too hot extra wet mopping and leaving the door off before loading helps to cool it, and a cup or two of water tossed in with the bread will temper the heat some. When too cool only if time permits, light a second fire of kindling sized wood, it will burn very rapidly in a hot oven.

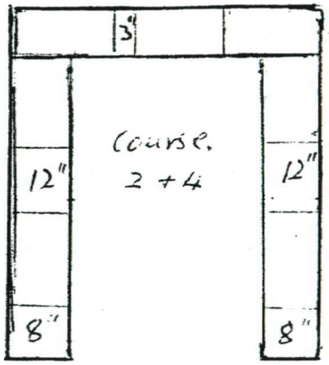


ALTERNATIVE BASE - 32"X38" OVEN

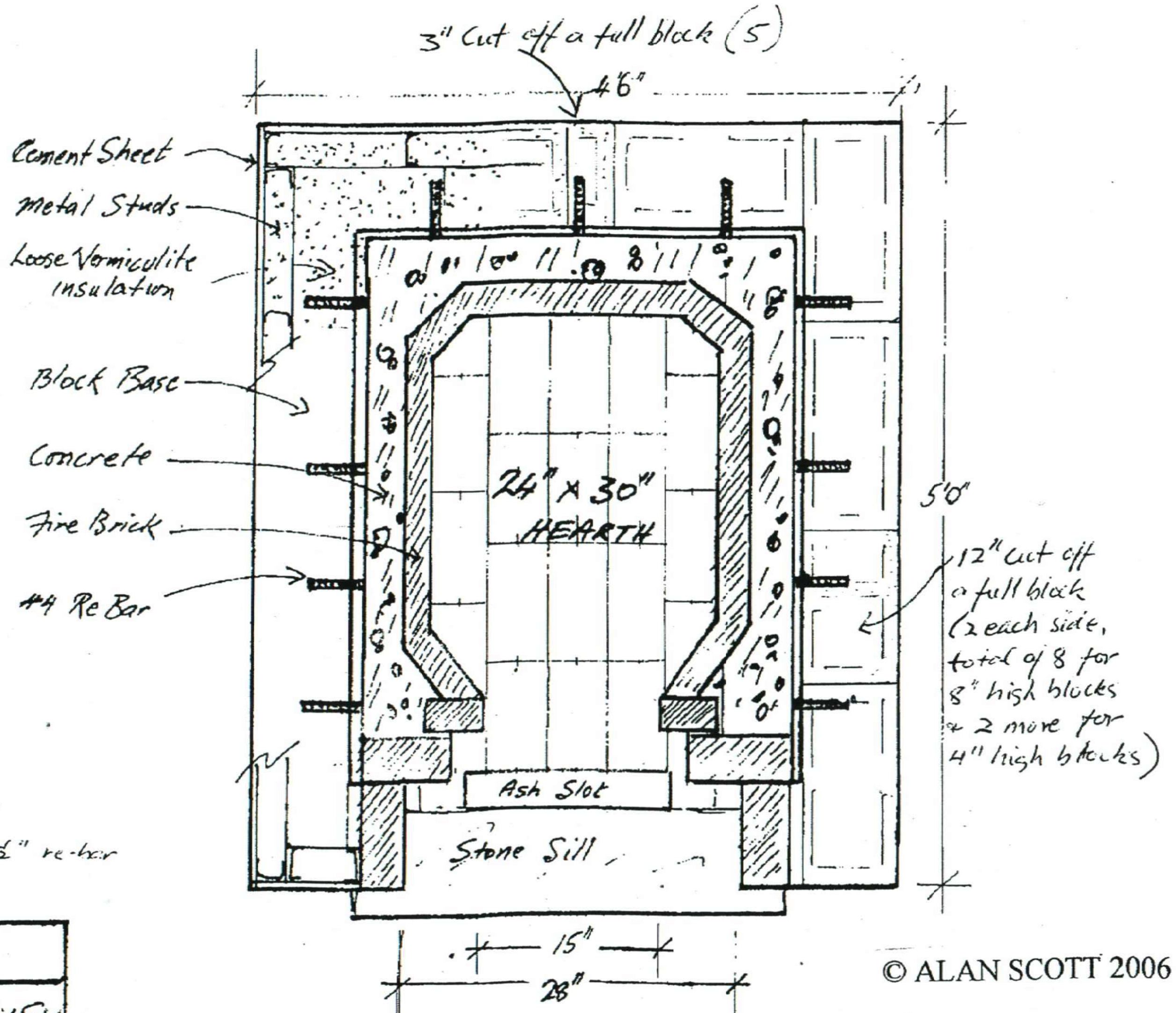








urse 4 is the 8x4x16 blocks
rse 5 will be a full circle of
the 8x8x16 block cut to hold ½" re-bar
+ filled with concrete


3" Cut off a full block (5)
4'6"
Cement Sheet
Metal Studs
Loose Vermiculite insulation
Block Base
Concrete
Fire Brick
#4 Re Bar
24" x 30" HEARTH
5'0"
12" cut off a full block (2 each side, total of 8 for 8" high blocks + 2 more for 4" high blocks)
Ash Slot
Stone Sill
15"
28"

© ALAN SCOTT 2006

24"x30" HEARTH OVEN

SCALE 1"=1'

~ PLAN ~

RICK BREAD + PIZZA OVEN

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ETALUMA CA 94952

24" X 30"

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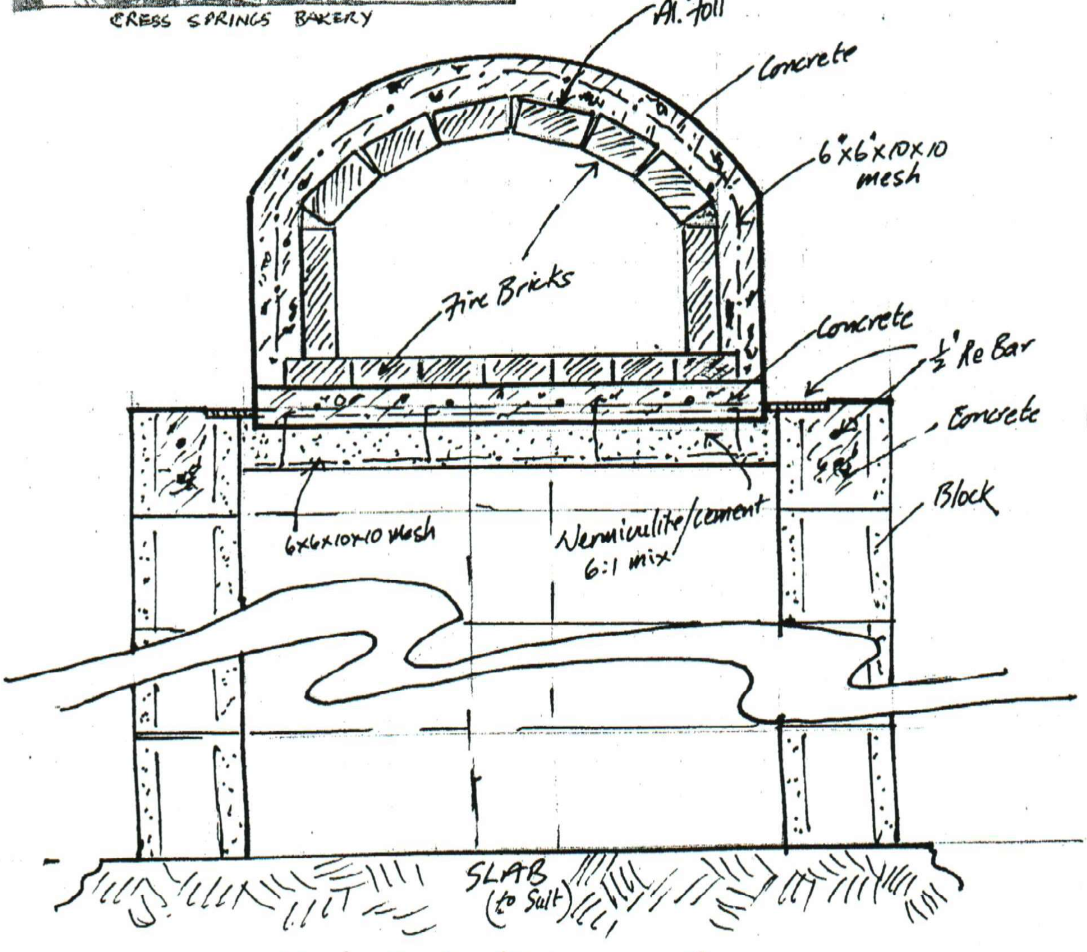
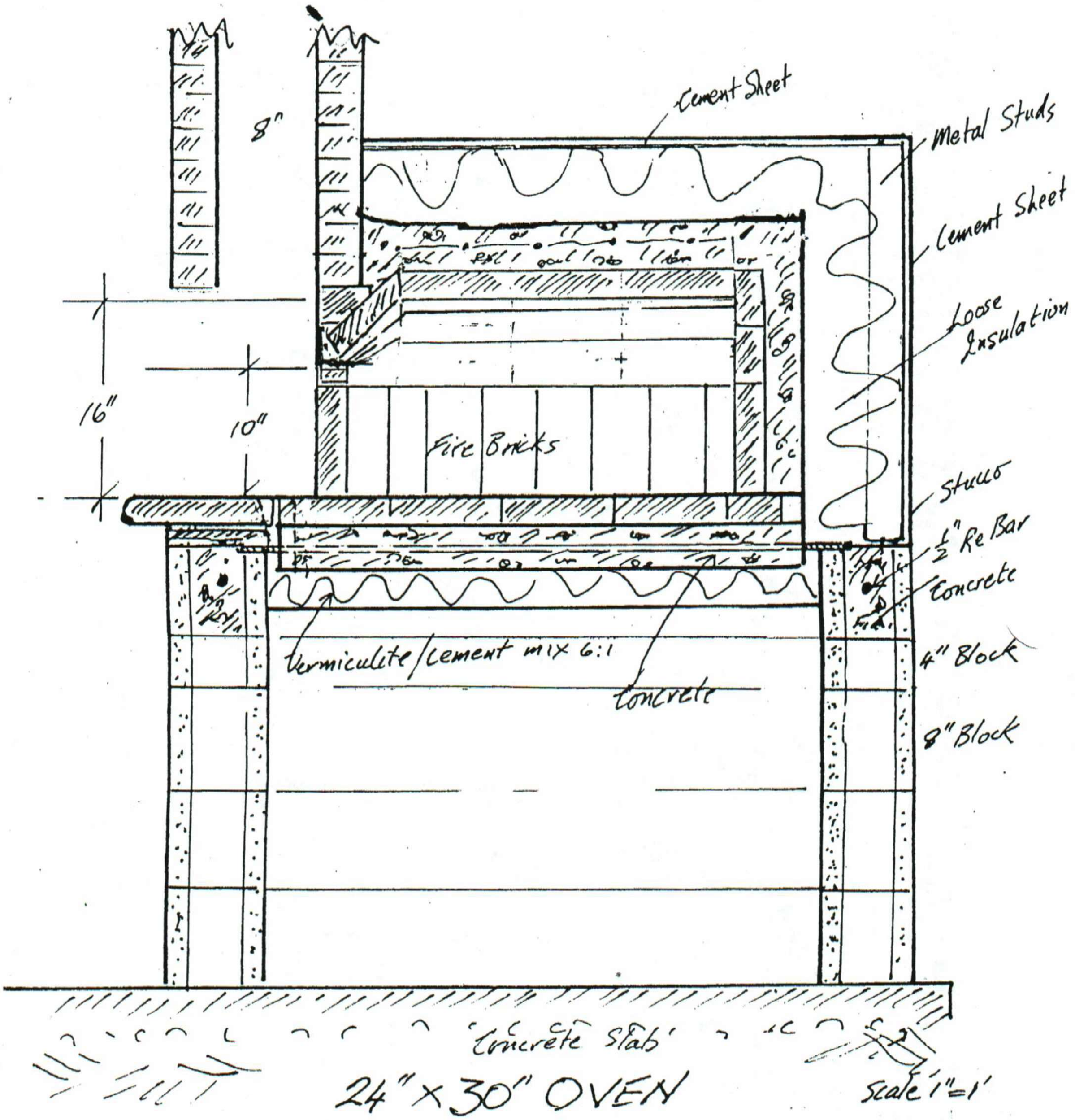
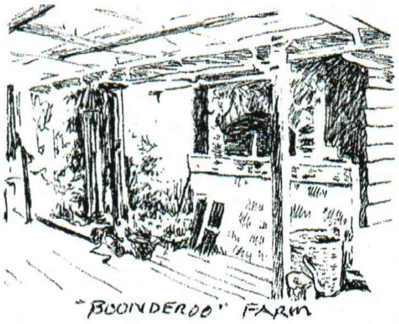
CRESS SPRINGS BAKERY



24"x30" HEARTH OVEN



24" × 30" OVEN



"BOONDEROO" FARM

OVENCRAFTERS

JULY 2006

5600 MARSHALL-PETALUMA ROAD
PETALUMA, CA 94952

MATERIALS LIST FOR THE 24" X 30" OVEN (Constructed to oven core only)

CONCRETE:

For footing and/or pad	to suit
For oven hearth slab, (3’6”x3’x 3 ½”)	(3 cu. ft.) 6 sacks 90 lbs Readymix Concrete
For oven cladding,	6 sacks 90 lbs Readymix Concrete
For oven walls and rear,	4 sacks 90 lbs Readymix Concrete

CONCRETE BLOCK:

For base 38" off the ground = Hearth at 42"	48 blocks 8"W x 8"H x 16"L
	2 blocks 8"W x 8"H x 8"L
	13 blocks 8"W x 4"H x 16"L.

NB: Special blocks are available for bond beams and for speed laying. Ask supplier.

REINFORCING BAR:

For Block Base Top Course Only (other to suit)	1 length 20' of 1/2"(#4)
For hearth slab	2 lengths 20' of 1/2"(#4)
For walls	1 length 20' of 3/8"(#3)

REINFORCING MESH:

For foundation	to suit
For hearth slab	1 of 3' x 2'6" approx of 6"x 6"x10 gauge
For oven cladding	2 of 3' x 3' approx of 6"x 6"x10 gauge

LUMBER:

For formwork	1 4' x 8' sheet of 3/4" CDX ply
	3 8' lengths of 2"x4" fir or pine
	2 8' lengths of 1"x4" for slab form

BRICKS:

Best quality *hardest* FIRE BRICKS, for oven	85
For outer arch and flue throat .... RED BRICKS	75 (approx)
For chimney	to suit

MORTARS:

For Oven Chamber	1 sack Portland cement
	1 sack clay, powdered.
	100 lbs fine sand
For base blocks	5 sacks readymix mortar
For throat and chimney brickwork	3+ sacks readymix mortar

LINTELS:

For base openings, two lengths each opening	3" x 3" x 3/16" angle iron (to suit)
For standard oven door	3" x 3" x 3/16" (or ¼") angle iron 24"+

FOIL:

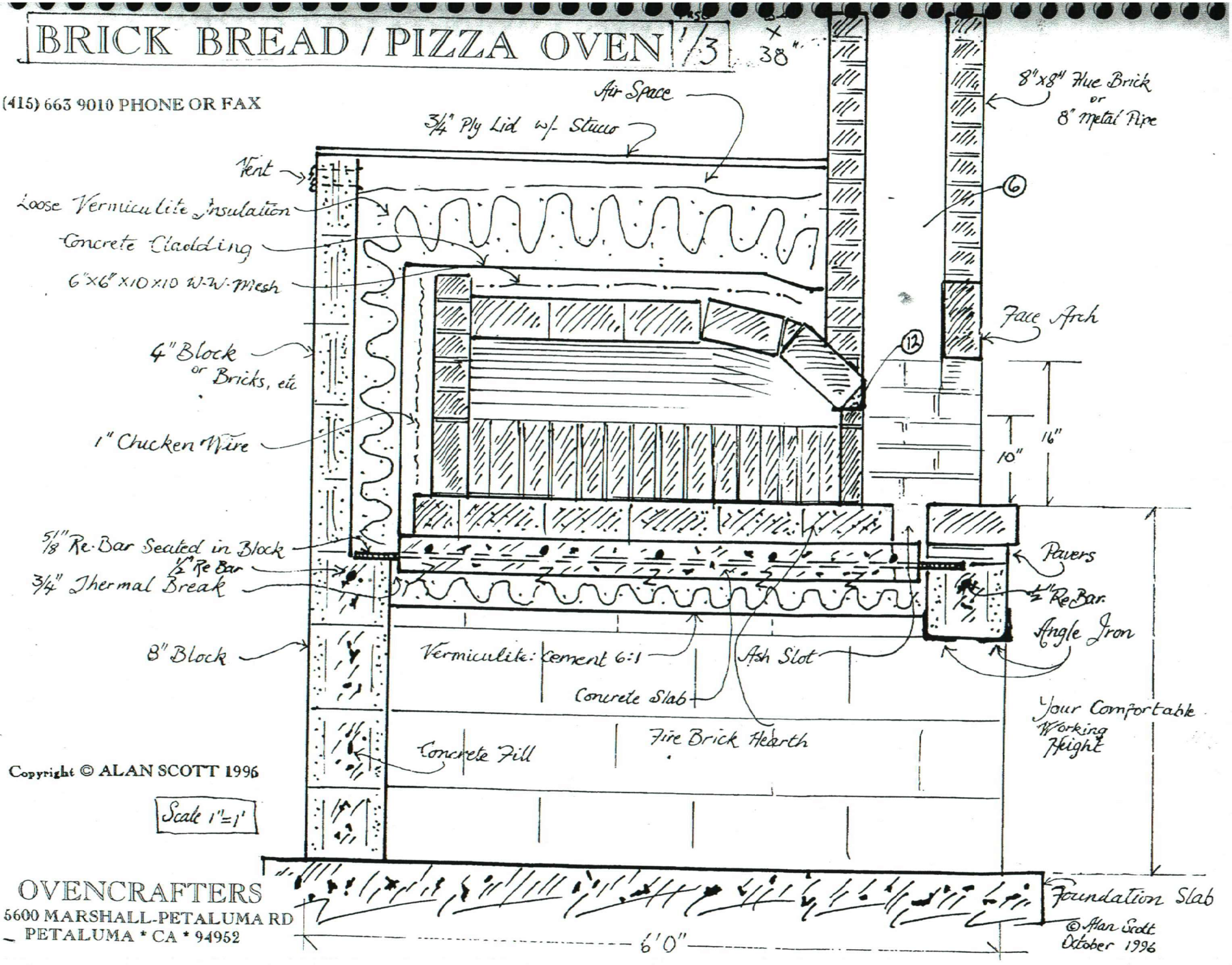
For oven	1 roll regular duty household foil

INSULATION:

For underneath the oven use	Vermiculite 19 1/2 lb sacks	1+ sacks
	Portland cement	1 sack

BRICK BREAD / PIZZA OVEN 1/3

(415) 663 9010 PHONE OR FAX



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Scale 1"=1'

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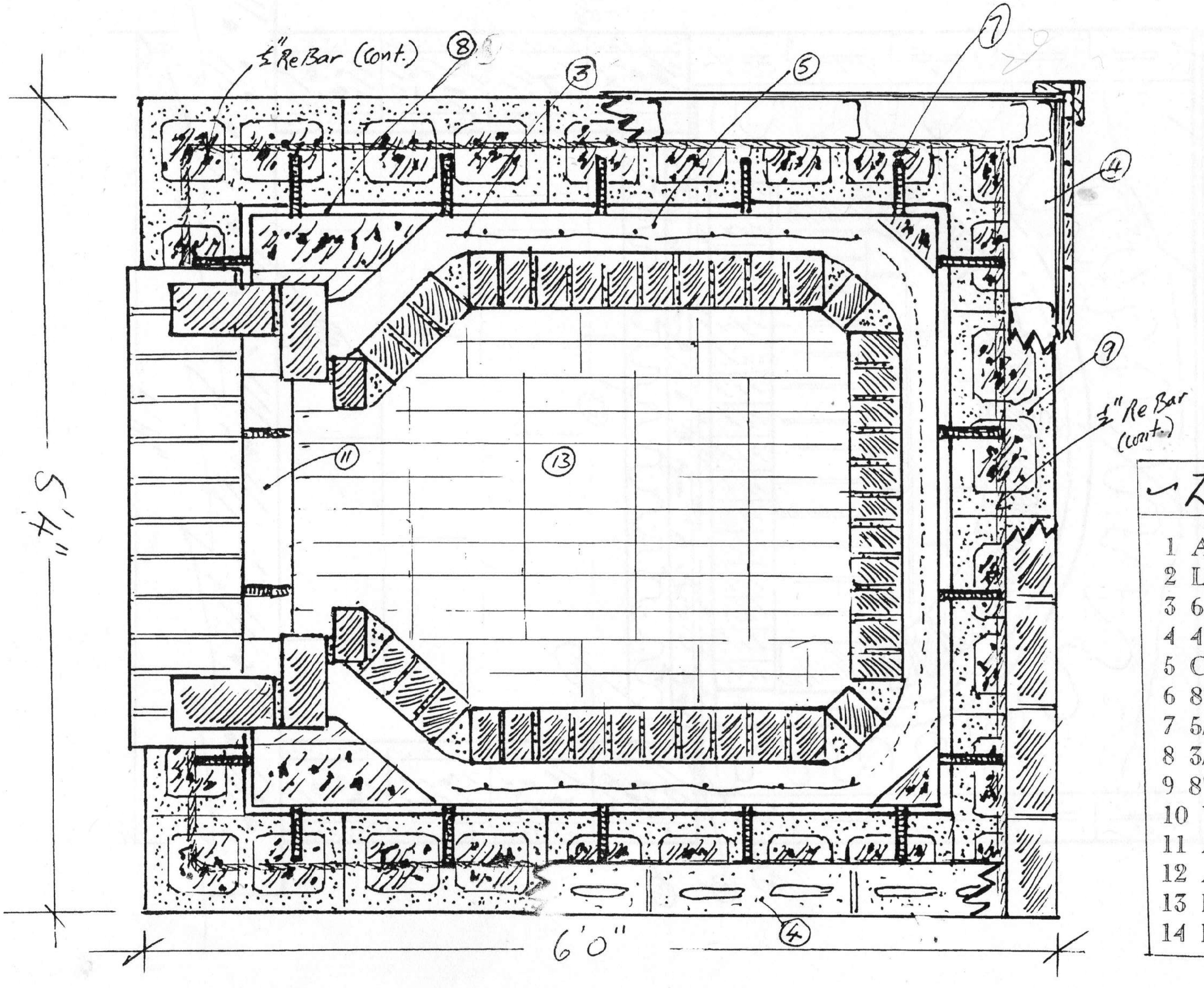
PETALUMA * CA * 94952

WOOD FIRED BREAD/PIZZA OVEN 2/3

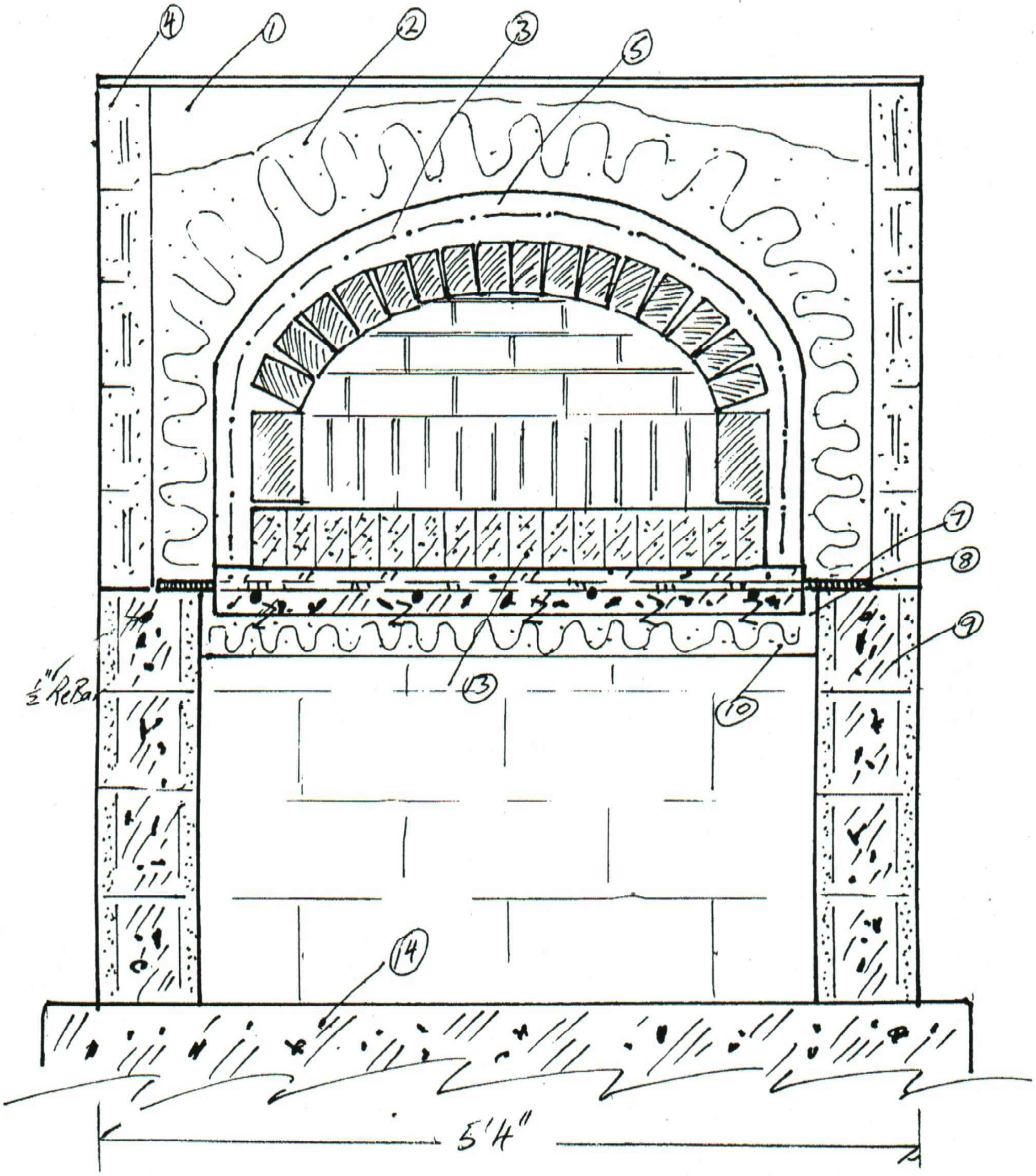
32"x 38"



Legend

1 Air Space
2 Loose Vermiculite Insulation
3 6x6x10x10 mesh
4 4" Block or Brick ok.
5 Concrete Cladding
6 8"x8" Flue or 8" metal Pipe
7 5/8" Re Bar
8 3/4" Thermal Break
9 8" Block
10 Vermiculite/Cement Mix 6:1
11 Ash Slot
12 Angle Iron
13 Fire Brick Hearth
14 Foundation Slab

WOOD FIRED BREAD/PIZZA OVEN 5/3 32 x 38



6x6 slab

OVENCRAFTERS

JULY 2006

5600 MARSHALL-PETALUMA ROAD
PETALUMA, CA 94952

MATERIALS LIST FOR THE 32" X 38" OVEN (Constructed to oven core only)

CONCRETE:

For footing and/or pad	to suit
For oven hearth slab, (4'x4'6"x3 ½") (5 cu. ft.)	9 sacks 90 lbs Readymix Concrete
For oven cladding,	8 sacks 90 lbs Readymix Concrete
For oven walls and rear,	6 sacks 90 lbs Readymix Concrete

CONCRETE BLOCK:

For base 36" off the ground = Hearth at 42"	53 blocks 8"W x 8"H x 16"L
	2-6 blocks 8"W x 8"H x 8"L
	15 blocks 8"W x 4"H x 16"L.
	1-3 blocks 8"W x 4"H x 8"L

NB: Special blocks are available for bond beams and for speed laying. Ask supplier.

REINFORCING BAR:

For Block Base Top Course Only (other to suit)	1 length 20' of 1/2"(#4)
For hearth slab	3 lengths 20' of 5/8"(#5)
For walls	1 length 20' of 1/2"(#4)

REINFORCING MESH:

For foundation	to suit
For hearth slab	1 of 4' x 5' approx of 6"x 6"x10 gauge
For oven cladding	2 of 3' x 4' approx of 6"x 6"x10 gauge

LUMBER:

For formwork	3 4' x 8' sheets of 3/4" CDX ply
	4 8' lengths of 2"x4" fir or pine
	4 10' lengths of 1"x4" for slab form

BRICKS:

Best quality *hardest* FIRE BRICKS, for oven	230
For outer arch and flue throat RED BRICKS	150 (approx)
For chimney	to suit

MORTARS:

For Oven Chamber	1 sack Portland cement
	1 sack clay, powdered.
	100 lbs fine sand
For base blocks	6 sacks readymix mortar
For throat and chimney brickwork	3+ sacks readymix mortar

LINTELS:

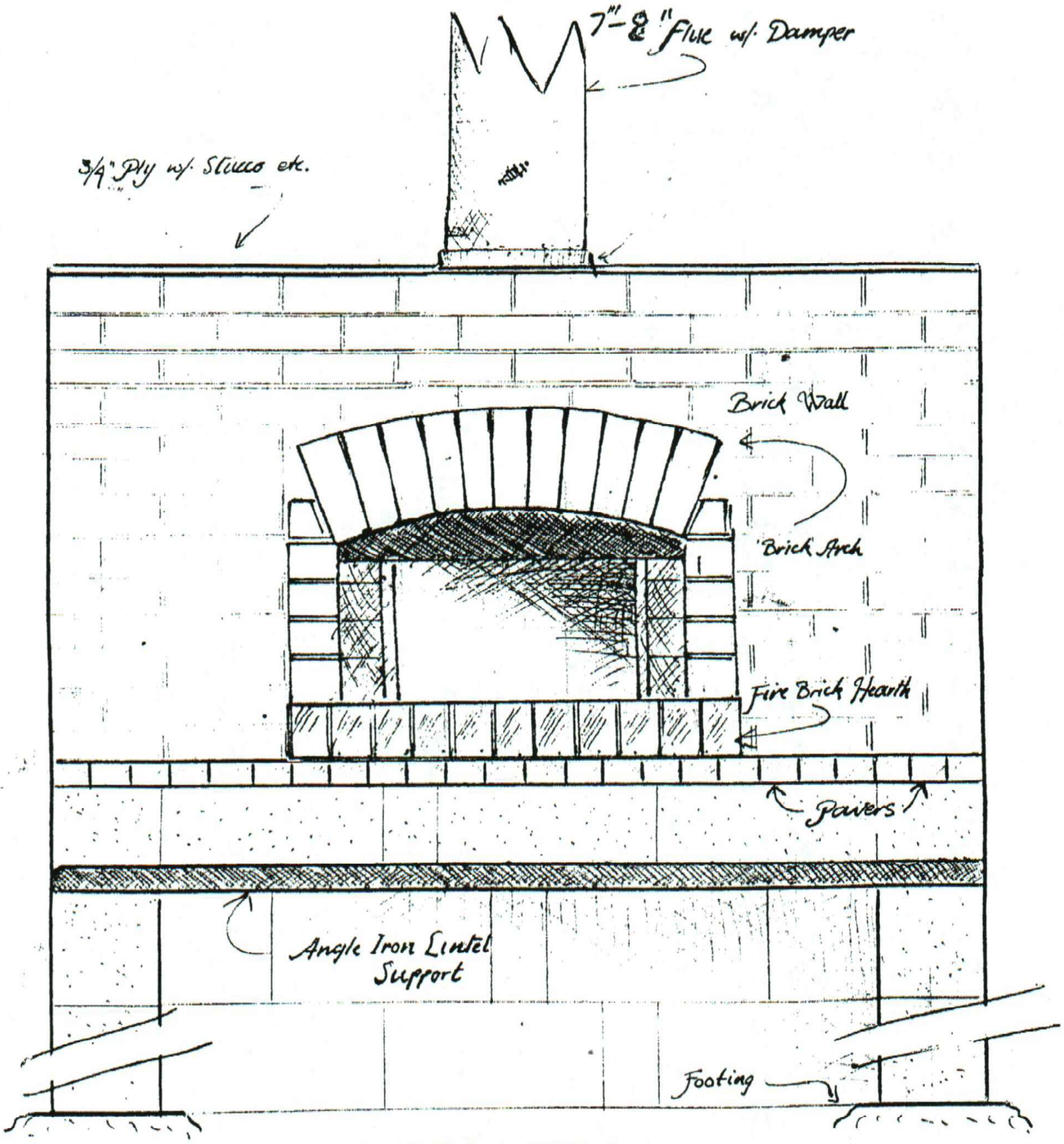
For base openings, two lengths each opening	3" x 3" x 3/16" angle iron (to suit)
For standard oven door	3" x 3" x 3/16" (or ¼") angle iron 30"

FOIL:

For oven	1 roll regular duty household foil

INSULATION:

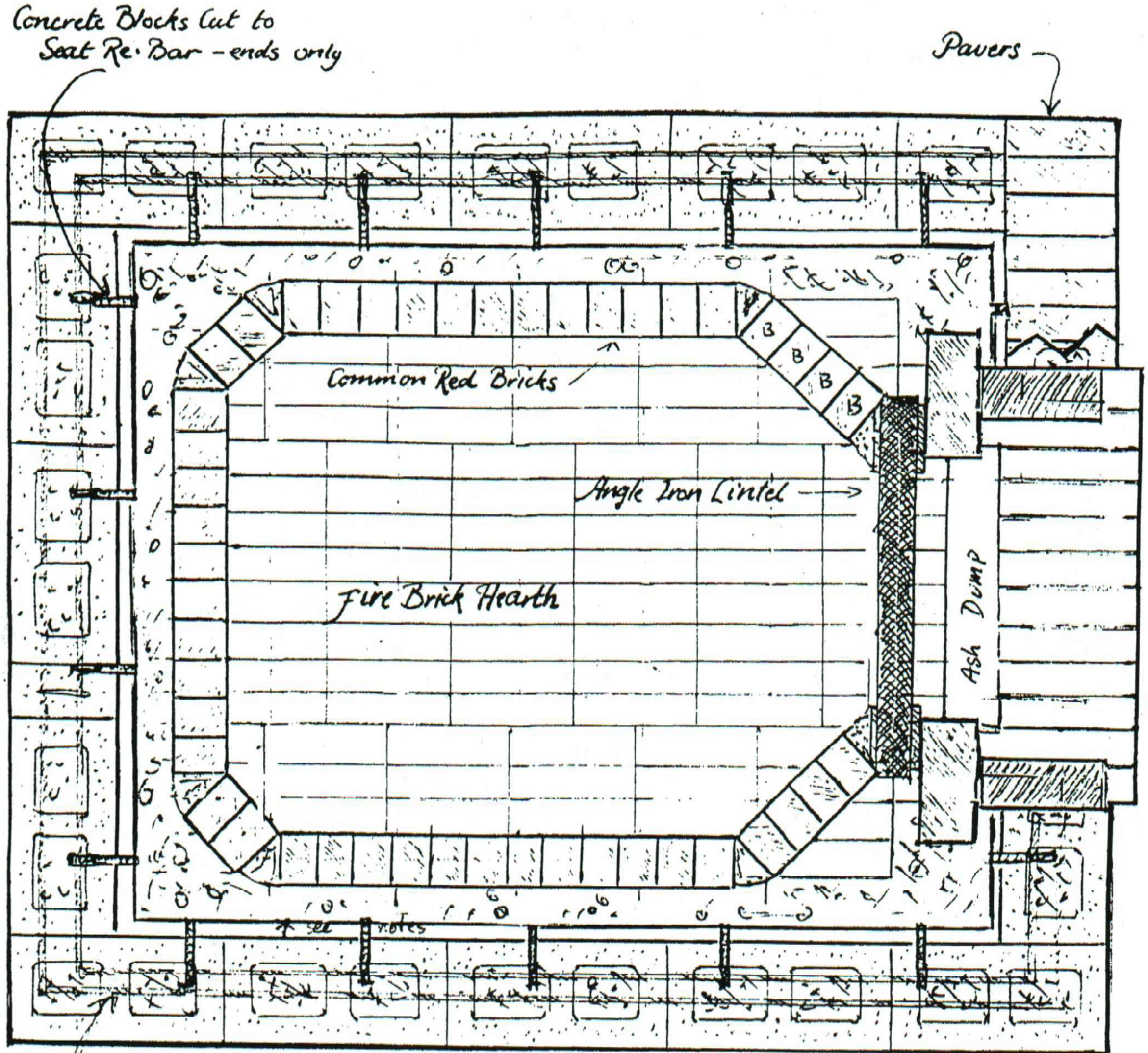
For underneath the oven use	Vermiculite 19 1/2 lb sacks	2 sacks
	Portland cement	1 sack



ELEVATION

36"×49" OVEN

SCALE 1"=1'

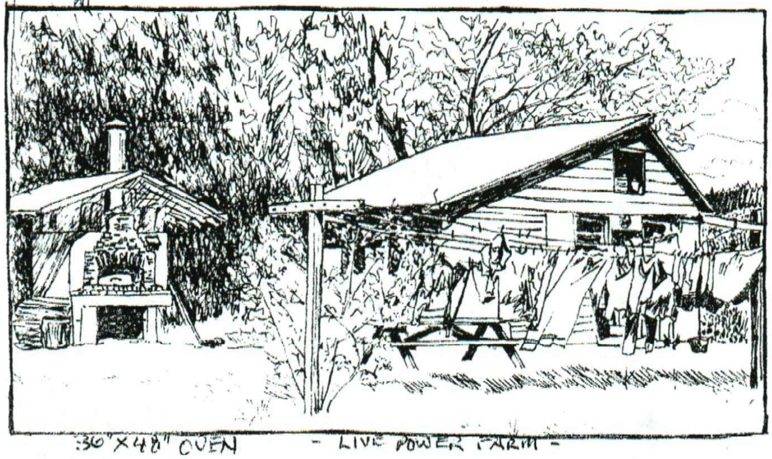


* NOTE BELOW

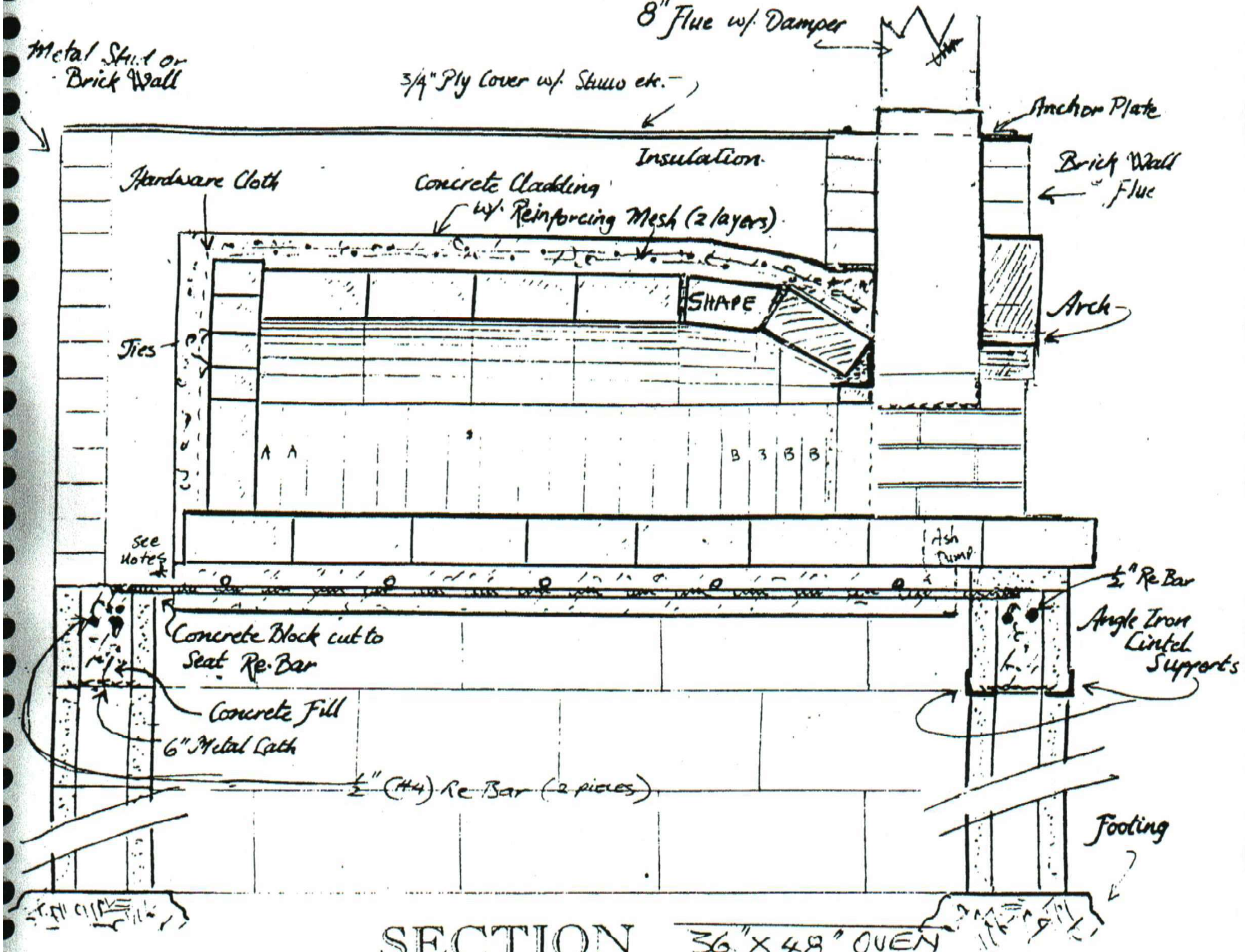
PLAN 36"×48" OVEN

*NOTE: Use 1 ONLY (#4) re bars in top course of block base and fill with concrete to create strong "bond beam"

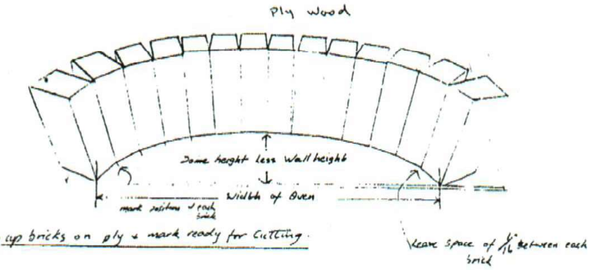
NOTES



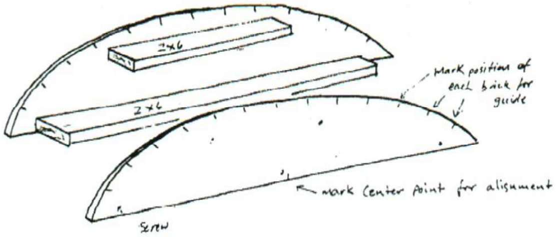
36"X48" OVEN – LIVE POWER FARM –



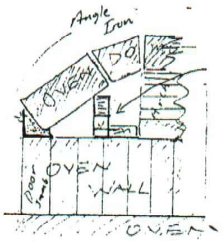
SECTION 36"x48" OVEN

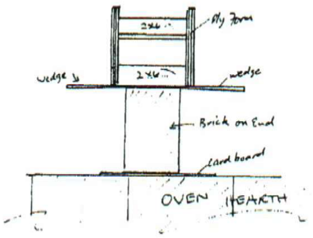

Ply wood
Dome height less Wall height
Width of Oven
mark position of each brick
Leave space of 1/16" between each brick

Lay up bricks on ply + mark ready for Cutting.


2x6
2x6
Mark position of each brick for guide
mark Center Point for alignment
Screw

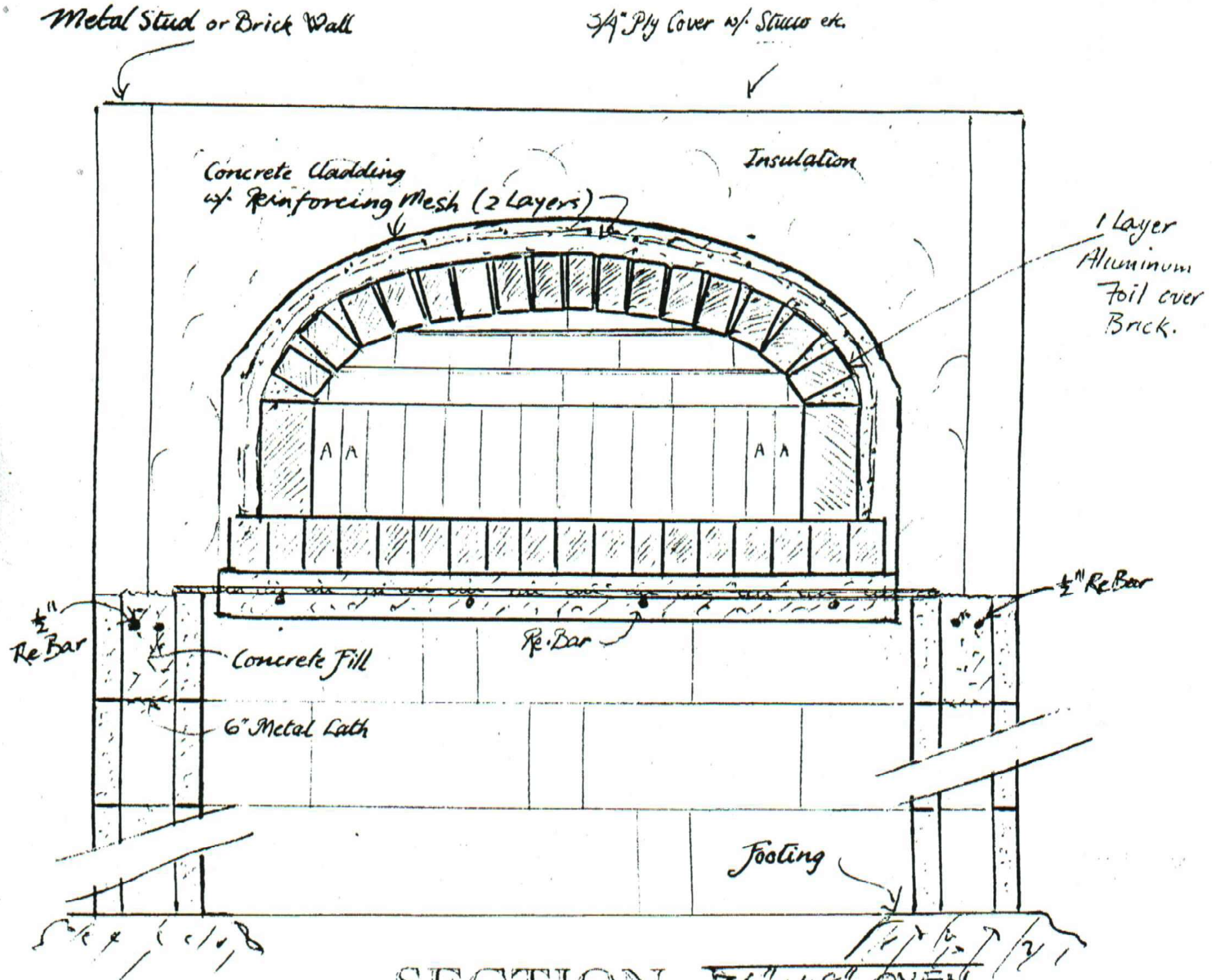
Cut out two forms + screw to 2x6 spacers.





Position Form in Oven.

ARCH FORMS


Metal Stud or Brick Wall
3/4" Ply Cover w/. Stucco etc.
Insulation
Concrete Cladding w/. Reinforcing Mesh (2 Layers)
1 Layer Aluminum Foil over Brick.
A A
A A
1/2" Re Bar
Concrete Fill
6" Metal Lath
Re. Bar
1/2" Re Bar
Footing

SECTION "36"x48" OVEN"

fig 2.

4

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HEARTH FIRE BAKERY

OVENCRAFTERS

JULY 2006

5600 MARSHALL-PETALUMA ROAD
PETALUMA, CA 94952

MATERIALS LIST FOR THE 36" X 48" OVEN (Constructed to oven core only)

CONCRETE:

For footing and/or pad	to suit
For oven hearth slab, (4'10"x3'10"x3 ½") (6.2 cu. ft.)	10 sacks 90 lbs Readymix Concrete
For oven cladding,	9 sacks 90 lbs Readymix Concrete
For oven walls and rear,	7 sacks 90 lbs Readymix Concrete

CONCRETE BLOCK:

For base 36" off the ground = Hearth at 42"	64 blocks 8"W x 8"H x 16"L
	2-6 blocks 8"W x 8"H x 8"L
	16 blocks 8"W x 4"H x 16"L.
	1-3 blocks 8"W x 4"H x 8"L

NB: Special blocks are available for bond beams and for speed laying. Ask supplier.

REINFORC[illegible]R:

For Block [illegible] Course Only (other to suit)	1 length 20' of 1/2"(#4)
	3 lengths 20' of 5/8"(#5)
For w[illegible]s	1 length 20' of 1/2"(#4)

REINFORCING MESH:

For founda[illegible]	to suit
For heart[illegible]ab	1 of 4' x 5' approx of 6"x 6"x10 gauge
Fo[illegible]ven cladding	2 of 4' x 5' approx of 6"x 6"x10 gauge

LUMBER:

For formwork	3 4' x 8' sheets of 3/4" CDX ply
	4 8' lengths of 2"x4" fir or pine
	4 10' lengths of 1"x4" for slab form

BRICKS:

Best quality *hardest* FIRE BRICKS, for oven		330
For outer arch and flue throat	RED BRICKS	150 (approx)
For chimney		to suit

MORTARS:

For Oven Chamber	1 sack Portland cement
	1 sack clay, powdered.
	100 lbs fine sand
For base blocks	6 sacks readymix mortar
For throat and chimney brickwork	3+ sacks readymix mortar

LINTELS:

For base openings, two lengths each opening	3" x 3" x 3/16" angle iron (to suit)
For standard oven door	3" x 3" x 3/16" (or ¼") angle iron 30"

FOIL:

For oven	1 roll regular duty household foil

INSULATION:

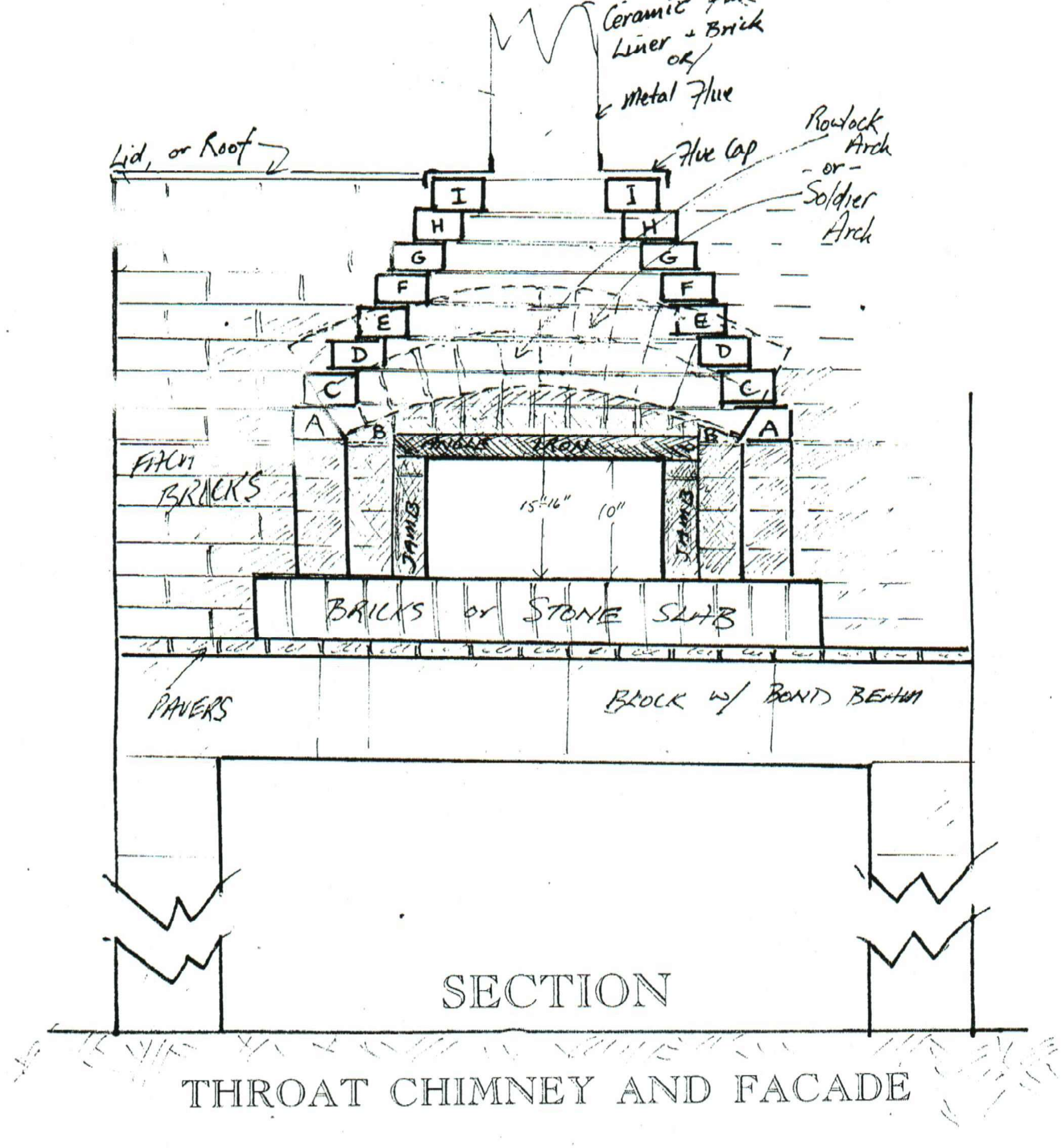
For underneath the oven use	Vermiculite 19 1/2 lb sacks	2 sacks
	Portland cement	1 sack

BRICK BREAD OVEN

OVENCRAFTERS
5600 MARSHALL-PETALUMA RD
PETALUMA CA 94952
(415) 663 9010

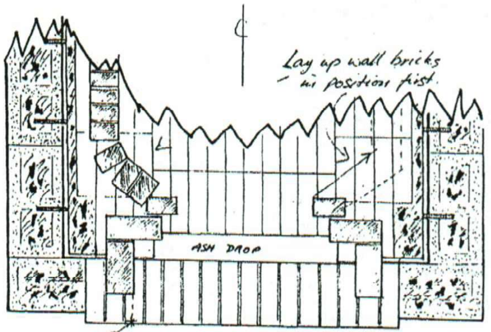
SEQUENCE FOR THE CONSTRUCTION OF THE THROAT CHIMNEY & FACADE

Scale 1"=1'
7 March 1994

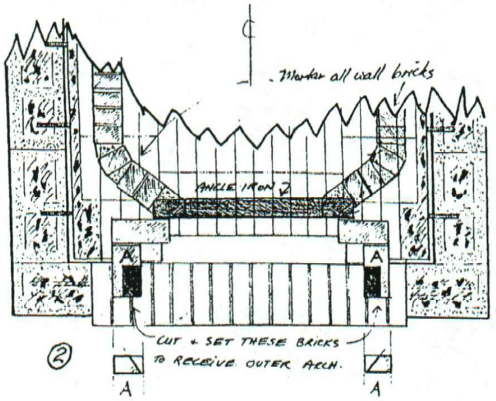


SECTION

THROAT CHIMNEY AND FACADE

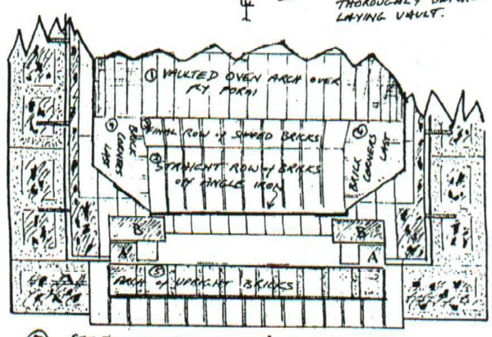


① LINE of SIGHT to ESTABLISH WALL ANGLE

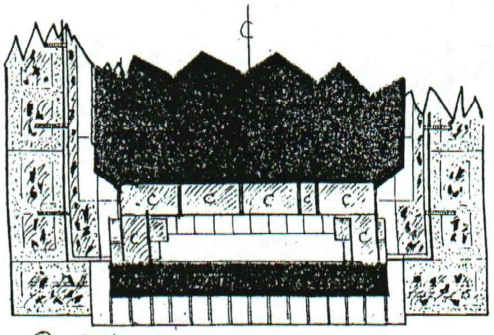


② CUT + SET THESE BRICKS TO RECEIVE OUTER ARCH.

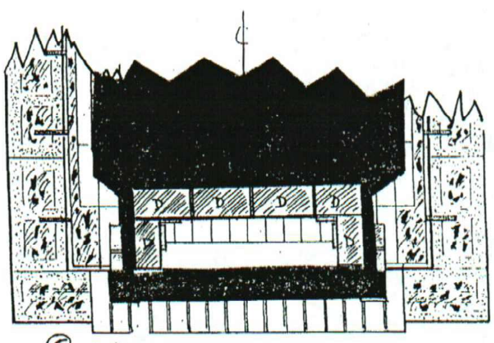
NB: BRACE THE WALLS THOROUGHLY BEFORE LAYING VAULT.


① VAULTED OVEN ARCH OVER PLY FORM
③ FINAL ROW of SHAPED BRICKS
② STRAIGHT ROW of BRICKS ON ANGLE IRON
④ BRICK CORNERS LAST
④ BRICK CORNERS LAST
B
B
A
A
⑤ ARCH of UPRIGHT BRICKS

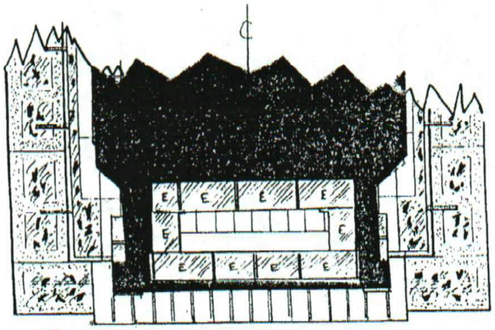
③ SET BRICKS "B" TO BRACE ANGLE IRON, THEN FORM OVEN VAULT IN THE ORDER SHOWN.



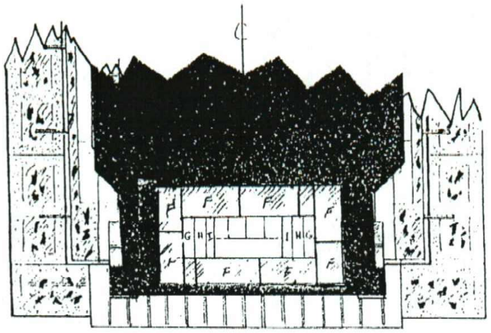
④ SET ROW "C" ACROSS TOP OF VAULT AND ABUTTING ARCH AT FRONT



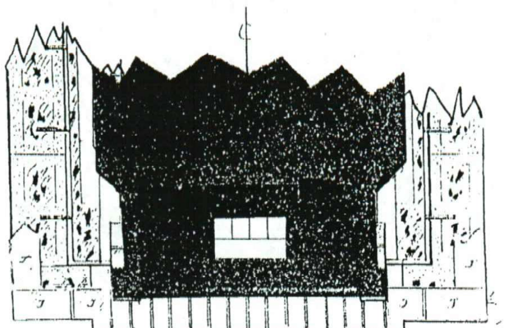
⑤ Row "D" begins to NARROW CHIMNEY THROAT



⑥ ROW "E" IS SHAPED TO FIT TOP OF ARCH AND CONTINUES TO NARROW THROAT.



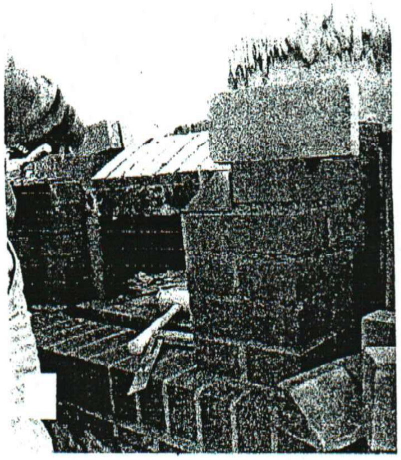
⑦ Courses F, G, H + I etc. Continue to narrow throat to take pipe anchor plate, or flue liner + brick chimney, etc.



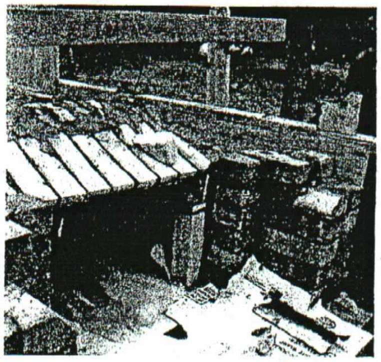
⑧ Build up facade + oven housing

Facade Bricks

Scale 1" = 2'



①



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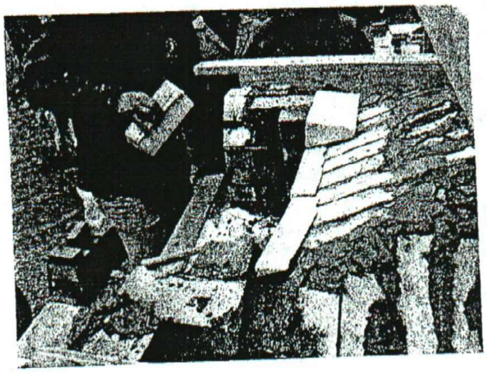
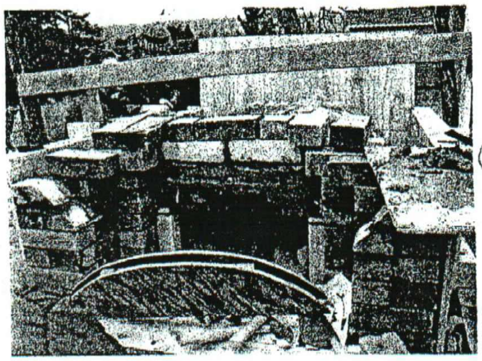


③

④



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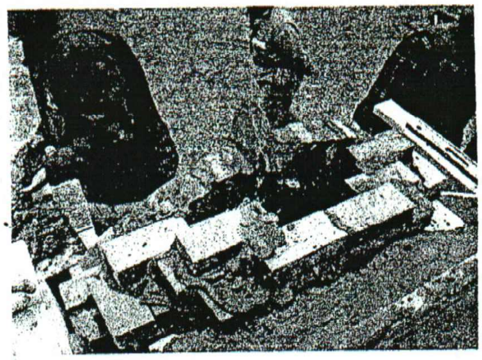

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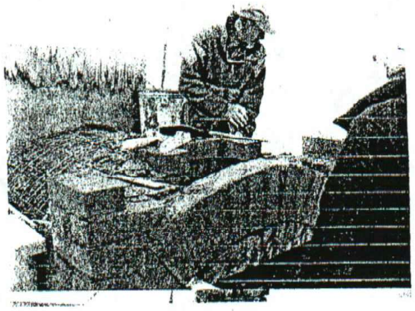

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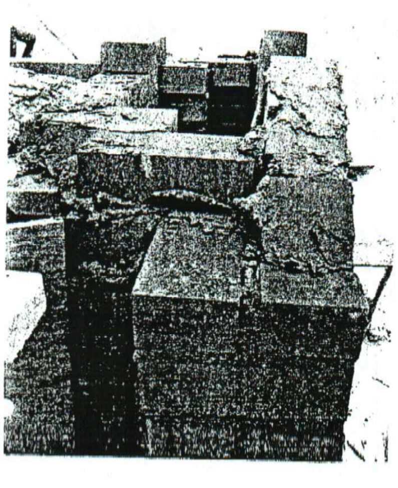
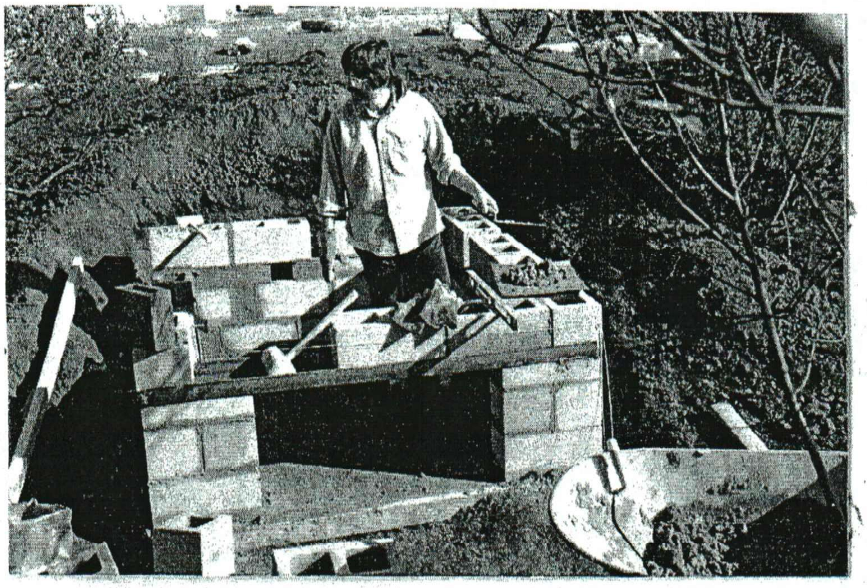


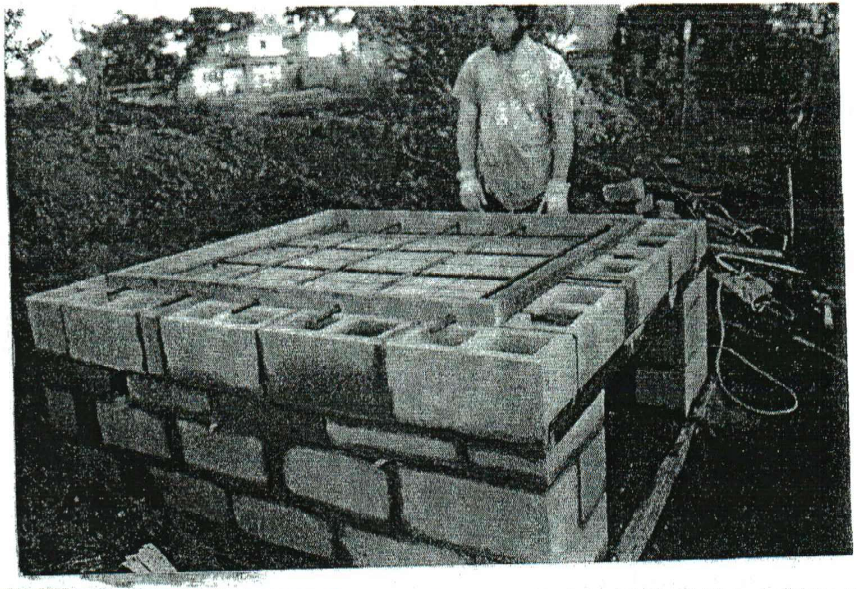
⑧

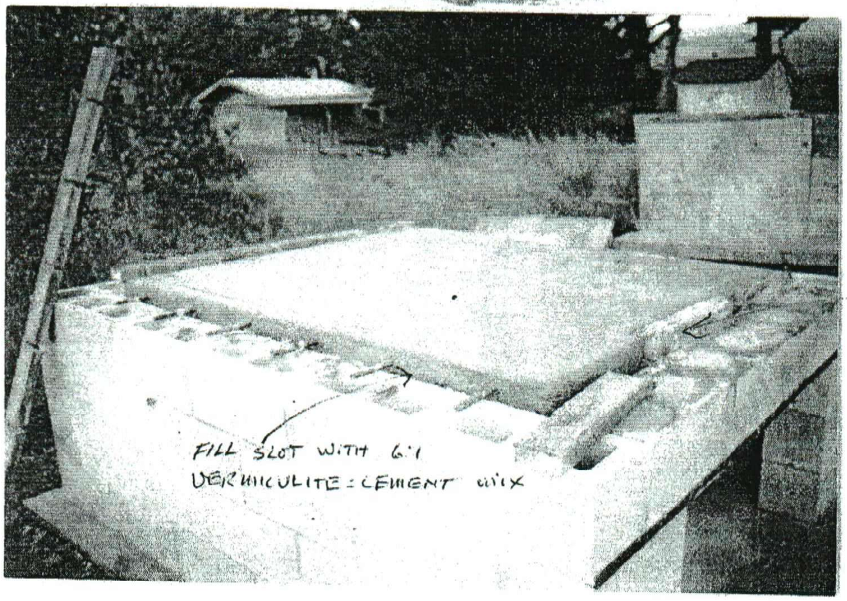


BLOCK BASE

36"x48" OVEN

FORMS for HEARTH

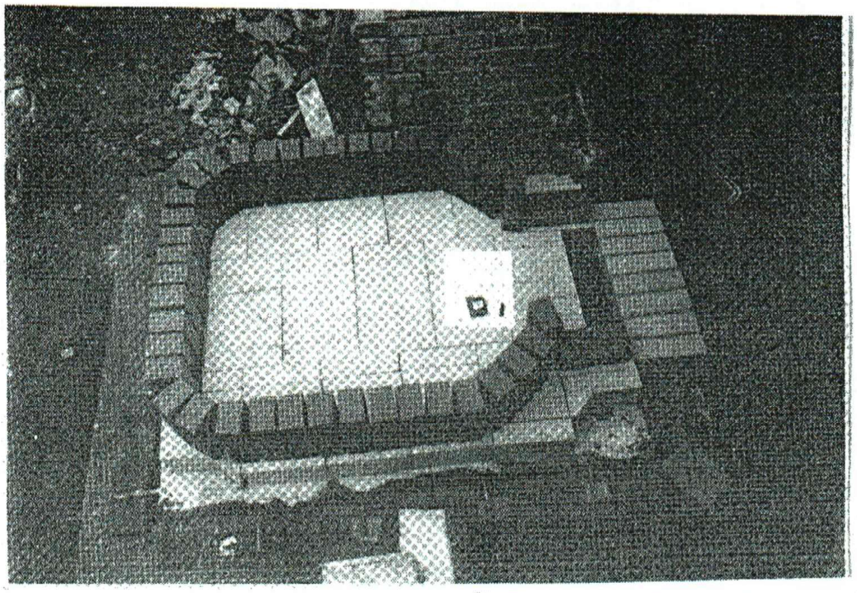




FILL SLOT WITH 6:1
VERMICULITE:CEMENT MIX

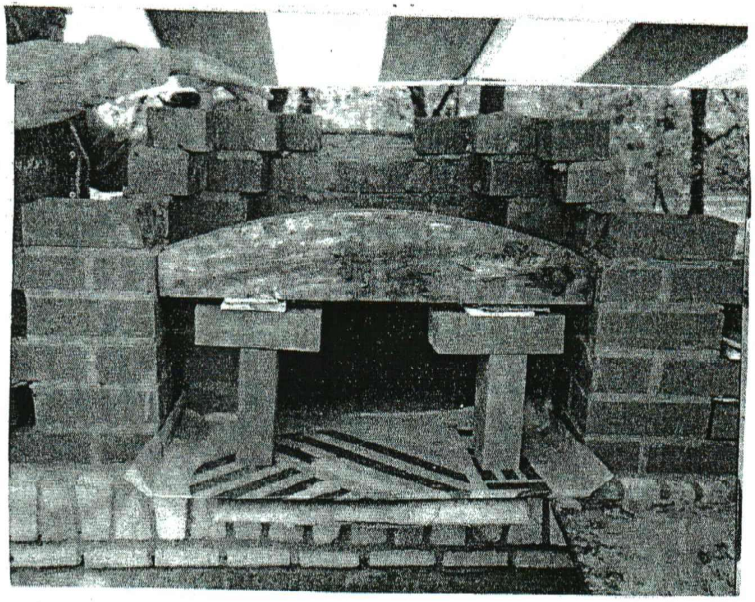
FORMS REMOVED

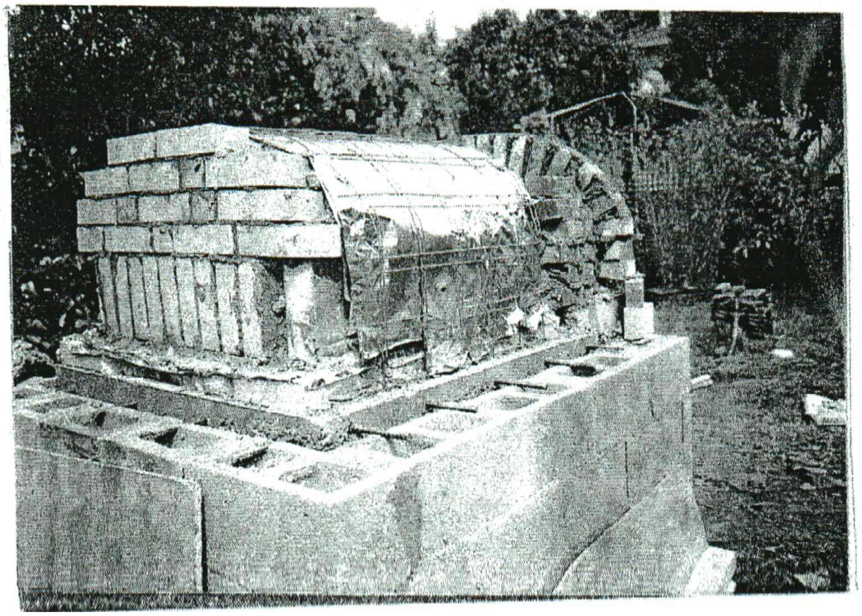
ASH SLOT PLUG



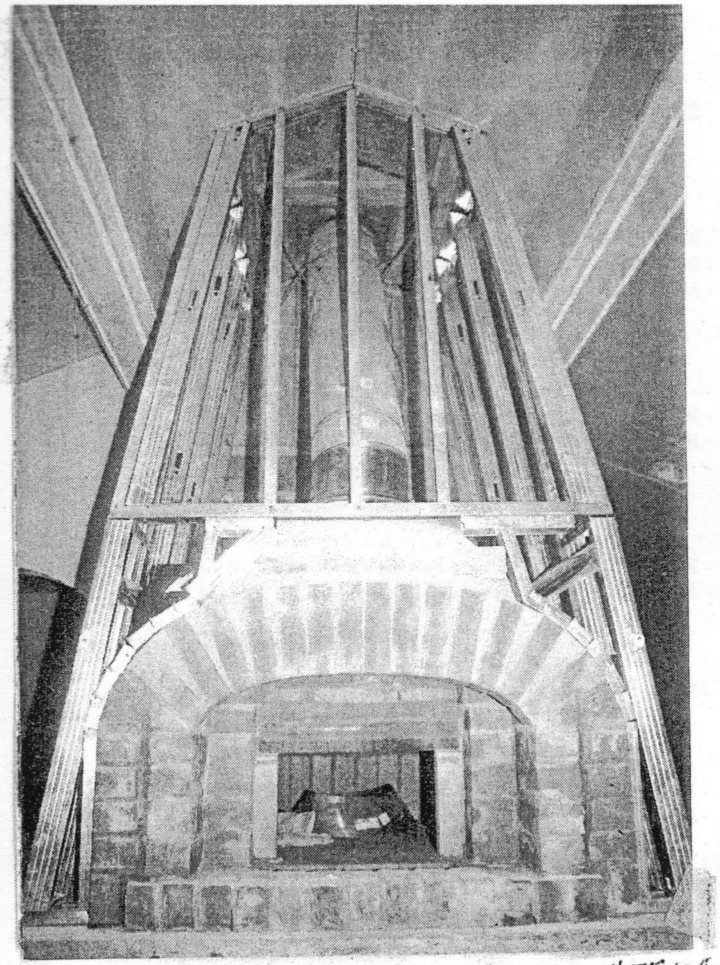
OVEN CHAMBER LAY-OUT

FORM for FACADE ARCH

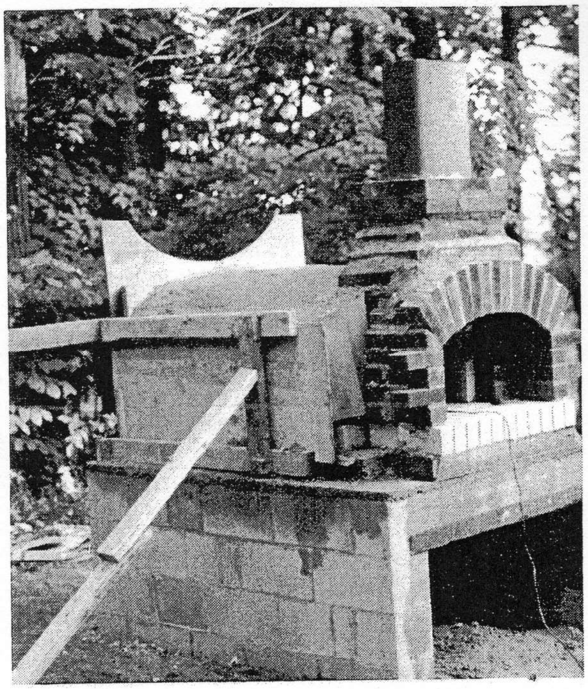




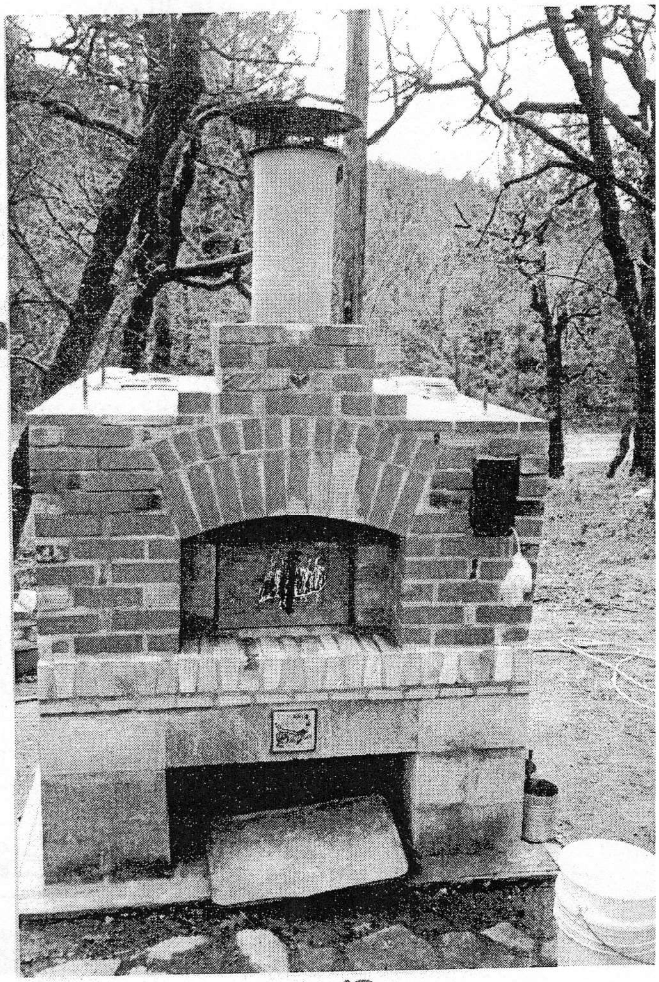
FOIL RELEASE OVER VAULT ONLY. (1 LAYER)



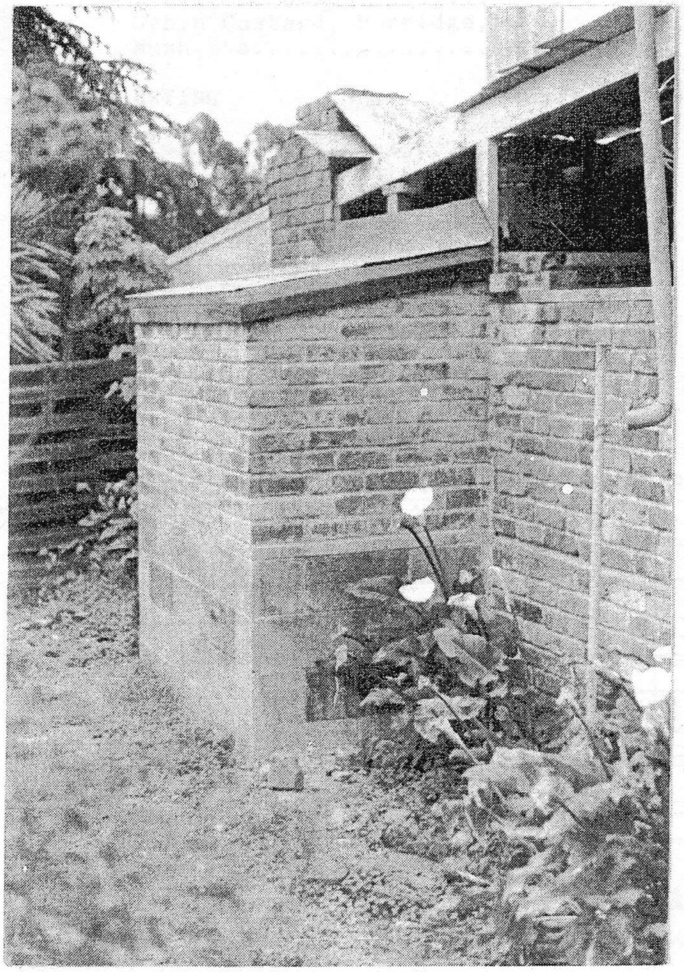
METAL STUD + CEMENT SHEET HOUSING



FORMS FOR CLADDING



POURED CONCRETE "ROOF"



EXTERIOR BRICK HOUSING

BRICK OVEN RECIPES AND TEMPERATURES C 1990

BREADS:

Desem	435-545 deg	35-50 min.
Natural Sourdough	435-510 deg	30-50 min.
Stollen, Fruit Breads	400-450 deg	45-60 min.

SODA BREADS:

Short Cake	375 deg	15-20 min.
Bran Muffins	370-410 deg	20 min.
Scones	425-450 deg	10-20 min.
Batter Puddings	375 deg	30 min.

FLAT BREADS WITH FIRE IN OVEN

Pita Bread	500-600 deg	4-8 min.
Pizza	450-500 deg	5-10 min.

CRACKERS

Scotch Short Breads	275-300 deg	20-50 min.

PIES

Apple	350-375 deg	60 min.
Quiche	350-375 deg	45-75 min
Chard and Cheese	425-deg	10 min
Pumpkin	300-350 deg	45-60 min.

CASSAROLES

Bean	275 deg	2 hrs
Vegetable	350-375 deg	50-70 min
Egg Custard	275 deg	60 min.
Overnight Beans	225-275 deg	6-12 hrs.
Grain Custard, Porridge, Mush, etc	200-250 deg	6-12 hrs.

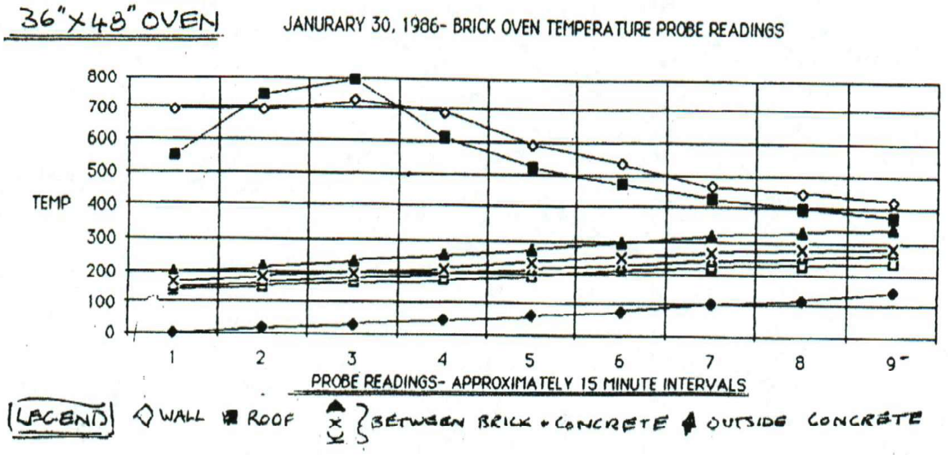
DRYING

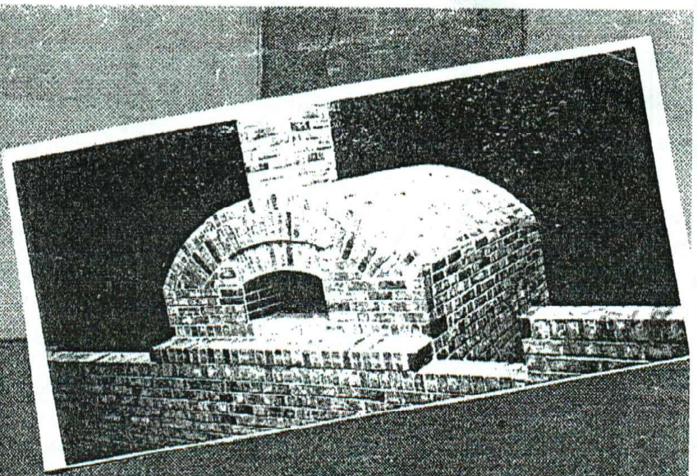
Almonds, light roast	300 deg	30 min.
drying only	190-200 deg	1-3 hrs.
Tamari Almonds	250 deg	60-90 min
Fruits	170-200 deg	10-12 hrs

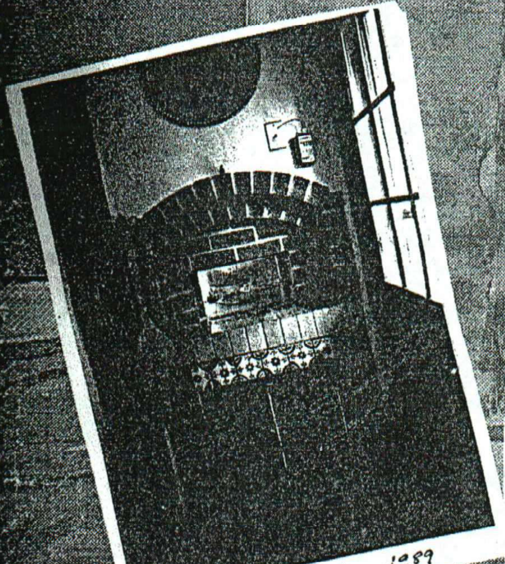
MISCELLANEOUS

French Fries	400 deg	45 min
Roasted Bread for Tea	320 deg	12 hrs.
Baked Apples	400 deg	20 min.

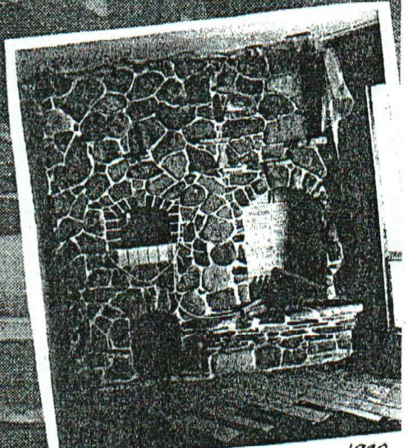
36"x48" OVEN



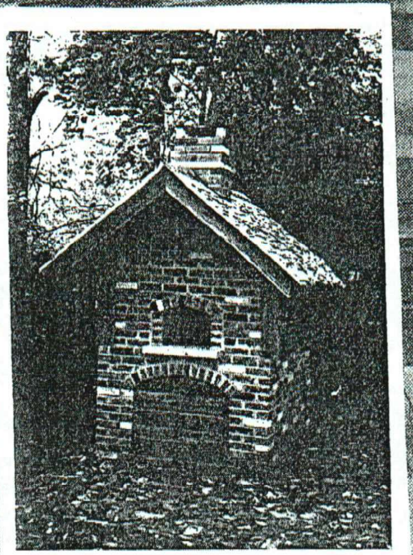




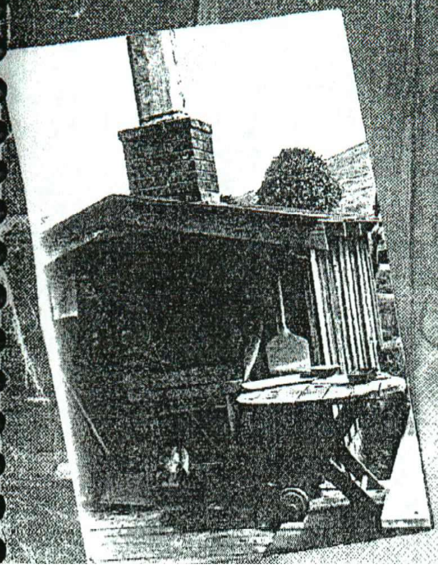
PORTLAND, OR 1989



SARATOGA CA 1990



OBERLIN OH 1990



AUBURN WA 1990

OVEN CRAFTERS

Alan P. Scott

5600 MARSHALL - PETALUMA [illegible]
PETALUMA CA 94952